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EDITORIALS

EDUCATIONAL OPPORTUNITIES OF THE HEALTH DEPARTMENT.

THERE is probably no division of a Department of Health which can accomplish more tangible results in the saving of lives than a Division of Publicity. The most serious enemies of public health, like tuberculosis, and infant mortality, can only be met by the individual citizen in the individual home. Good sanitary laws and effective systems of inspection, valuable as they are, will accomplish only a small part of what can be attained by spreading knowledge of the ways in which disease spreads, and the ways in which it is prevented, among the mothers who bring up the babies and the men who pay rent in the tenements and work in the stores and factories. The most progressive boards of health have seized this opportunity. Chicago issues a weekly bulletin which is so well edited that its health cartoons and pithy statements of sanitary truths are quoted all over the country. 7,000 copies of this bulletin are printed and sent to every doctor, preacher and school in the city and to anyone else who may be interested. The material is given to the morning dailies for use on Sunday and the bulletin goes out on Monday. In addition, the Chicago health department maintains a special press service for church papers, labor papers, papers published in foreign languages, etc., and sends out

weekly bulletins to be posted on the bulletin boards in factories and stores. State boards of health have done very valuable work along similar lines through the circulation of monthly bulletins and leaflets dealing with particular communicable diseases. It is perhaps not invidious to mention the bulletins of the Virginia Health Department as specially notable for effective presentation and soundness in subject matter.

It is obvious that the successful conduct of such educational work demands special qualifications on the part of the editor. It is unfortunately true that some of the state health boards which have gone actively into this field have at times sacrificed scientific accuracy to the exigencies of dramatic effect and in a number of cases the official pronouncements of such boards have tended to foster the ancient errors from which modern sanitary science is gradually being freed. The official in charge of publicity work must first of all have a thorough grasp of the scientific principles and the established facts relating to the spread and the prevention of disease. In addition to this, however, he must be a master of the peculiar technique of publicity and the combination is a rare one.

The chief opportunity for the Division of Publicity lies in the development of the weekly bulletin in a city and the monthly bulletin in a state. Each of these documents might well be printed in an edition large enough for wide distribution and might include a chart, diagram or cartoon illustrating some timely sanitary lesson, further emphasized in a brief editorial. Tabulated vital statistics could be reduced to a minimum and the general conclusions to be drawn from them in regard to health conditions and the activities of the department set forth clearly in the text. Special arrangements should be made for giving the "live" matter in the bulletin to the press in such form and under such conditions as to insure its publication.

With a Division of Publicity once established many special opportunities for educational usefulness will naturally enough suggest themselves. The annual reports of the Board, the circulars issued by the Bureau of Contagious Diseases and indeed all the popular publications of the Department would profit by skilled editorial supervision.

Ultimately, there might be developed under the Division of Publicity a lyceum service such as has been developed in Chicago and by Dr. Hurty and his associates in the work of the State Board of Health of Indiana. If the Department of Health were prepared to furnish effective lectures with lantern slides to schools, churches, women's clubs, labor unions, etc., it could do an immense amount of valuable educational work. In Chicago

the moving picture films of The Acrobatic Fly and The Man Who Learned, have been exhibited by the Health Department in the nickel theatres with success.

The preparation of exhibits which is coming to play such an important part in the public health campaign might also be assigned to the Division of Publicity if it seemed desirable to do so.

It is granted that all these agencies may be so misused as to be merely spectacular, to discredit the Health Department and to disseminate half-truths which are more dangerous than ignorance. These are arguments for caution, however, but not for inaction. The aims of sanitary science can only be attained by the individual effort of the members of the community and somehow the knowledge upon which they are to act must be brought to their doors. A properly conducted educational campaign is the only means of securing intelligent co-operation in the private and personal conduct which underlies public hygiene and sanitation; and at the same time it develops a public interest which insures moral and financial support for the more definite organized activities of the health department.

C.-E. A. WINSLOW.

PELLAGRA.

THE recognition of pellagra in the United States has proven to be not only an occurrence of much local importance, but has apparently also served as a stimulus to increased interest in this disease in the European medical world.

In our own country we have seen observations, reports, literature, etc., multiply with almost explosive violence. A national society has been established and various commissions appointed for the study of this new addition to our nosology. In England a British Commission has been formed, and a field commission sent to Italy for the study of this disease. And now the Italian Government has appointed a Commission for the study of new scientific views relative to the etiology and prophylaxis of pellagra.

It is reported that an eminent European scientist when he learned that pellagra had been recognized in the United States, said, "I am sorry—and I am glad," explaining that he was sorry for the affliction, but glad that the question of pellagra had become acute to the American profession, for he would now expect American energy to clear up the confusion which existed with regard to pellagra.

In a way, it may be said that the present status of this etiological question comprehends two general lines of thought. First, the traditional view that pellagra is a maize food-poison, allied to ergotism; second, that it is a disease due most likely to some animal parasite. This latter view is gaining force constantly as is abundantly evidenced by the fact that the Italian Government has felt called upon to appoint a Commission for the scientific study of this new idea.

It is, however, a healthy sign and one full of promise. For it cannot be denied that corn in Italy has become somewhat of a scientific dogma in the domain of pellagrous etiology, and to some even more—a dogma which it would be almost profane to question. This is an unwholesome position for science to assume and has in all likelihood done much to prevent further advance.

This parasitic idea of pellagra, first suggested by Sambon in 1905 and recently much amplified by him, has been followed by Alessandrini of the University of Rome. Sambon contends for an insect-born, protozoal parasite, and Alessandrini apparently for a water-born, nematode worm

of the genus Filaria. That some suggestion similar to that of Sambon was not earlier made is worthy of remark. It is none the less to Sambon's credit, and only serves to emphasize this same dogmatism already noted.

Dr. Sambon has developed and defended his idea in a recent very able report to the British Commission. Without attempting to discuss this report there are one or two suggestive points in this connection.

Sambon's theory is at present based solely on epidemiological data and is unsupported by laboratory work. Sambon himself, with much force, has pointed out that epidemiological data are often of as much weight as laboratory data, and perhaps less susceptible of wrong interpretations. The scientific world, however, will doubtless await laboratory findings.

The greatest positive value of Sambon's work at present is definitely to point out the inadequacy of the corn theory, in its present state, to explain existing facts; and this is an achievement of no small importance. For, whatever else it may do, it must inevitably result in healthy criticism, wider views, new fields of research, and greater activity on the part of those interested in this particular field.

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American Public Health Association

PREVENTIVE PRINCIPLES IN THE FIELD OF MENTAL MEDICINE*

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The field of mental medicine, which by the way, is much broader than that implied by the term insanity, with which it is ordinarliy supposed to be coextensive, is generally presumed to offer little either as a result of treatment or prophylaxis. It will be my object in the few words to which the temporal limitation of my paper confines me, to try and dispel this impression—to bring a message of hope.

There are many causative factors that may operate to unbalance the mind. In fact, there are but few cases that come to us but owe their condition to several rather than to one cause. Many of these causes are familiar and well recognized. Of such causes as the infectious diseases such as typhoid, yellow fever, malaria, smallpox, diphtheria, I need not speak before this body. The work that you are doing in controlling infections of this character naturally controls also the mental sequelae that are not infrequent. I may say in passing, however, that important as is the problem of tuberculosis, and little as I would desire to minimize that importance, still I am of the opinion that the two venereal diseases, syphilis and gonorrhoea, produce quite as much suffering and I am sure that the former alone produces much more insanity, directly at least, than tuberculosis, and further, while the tendency of tuberculosis is, to a considerable extent at least, to weed out the unfit, here is a disease the distribution of which is controlled by accident and so it takes from us only too often the most useful and efficient members of the community, while the latter disease sterilizes many a woman who would make a good mother.

The venereal diseases, particularly syphilis, are of extreme importance in the causation of insanity and come directly within your province as public health officials. Of equal importance, though having directly sociologic as well as medical bearings, is alcohol. Alcohol and syphilis taken together are generally regarded as being responsible for twenty-five per cent of the insane. Although at first sight this statement is alarming on second thought it is reassuring because both of these causes are strictly preventable.†

* Read at 38th Annual Meeting of American Public Health Association, Milwaukee, September, 1910.
† Salmon, Thomas W., M. D.: Two Preventable Causes of Insanity. Pop. Sci. Mon., June, 1910.

However, it is not my intention to burden you with matter of this sort but rather to call to your attention some opportunities for the utilization of preventive principles which are less obvious.

These preventive principles have to do with those mental disorders that are not primarily dependent upon physical disease. There are a host of such disorders that are dependent to a greater or less extent upon purely psychological factors—mental causes. The individual at some point or other comes into conflict with the conditions about him, in which he must live, and to which he must adapt, if he is to proceed in life with anything like efficiency, and he fails to make the necessary adjustment. He is unable, for example, to reach a condition of emotional calm after the loss by death of a dear friend or relative, or after a disappointment in love; he cannot get on his feet again after being ruined by a trusted employe; he is placed in a position of too great complexity for a limited mental equipment and can not produce results that are up to reasonable expectations. At these periods of conflict failure is not infrequently expressed by the development of a psychosis. Failures of this sort, the inability of the individual to square up with the events of every day life, upon analysis are found to depend largely upon faulty and erroneous view points, upon vicious habits of thought, upon narrow and inadequate ideals, false notions and ambitions, in short upon a biased mental attitude towards the world of things and events.

Here are a series of conditions which strike you immediately as due in the larger sense to bad education, and in fact they are. The conflicts which arise, arise in large part because the mind has been so constituted by previous experience as to make conflicts out of certain kinds of circumstances rather than to adjust peaceably. Take, for example, the man who is always criticizing everyone about him; this thing and that are wrong, his superior in rank should have done thus and so, he would have done differently, etc., etc. That man makes the greatest amount of trouble for himself; he positively insists upon being unhappy. Instead of accepting conditions which he cannot change and making the best of them he frets and chafes under them, he actually looks for things with which to find fault, he positively will not be content in the sense in which contentment is desirable. Such a man is inviting disaster by using up his energies in a useless thrashing about, usually without the corrective of that satisfaction which comes from things accomplished. The young woman, of a distinctly different type, who develops a hysteria as a result of a disappointment has actually succumbed to a psychosis because of her failure to accept—to adjust. Instances might be indefinitely multiplied but the

fact I mean to bring out is that numerous psychoses are dependent upon mental causes which in their nature are removable or preventable, and subsequent attacks after recovery are alike produced in the same way.

People such as these, who present characteristics unfitting them for a peaceful adjustment to the difficulties of everyday life owe their defects to faults of education, by which term I include all that life of experience which is addressed directly or indirectly to the preparation for the independent life of adulthood.

The places where this education is for the most part acquired are two—the school-room and the home. Let us speak for a moment first of the home. The fundamental fact here is that the important groundwork of later life is laid much earlier than is ordinarily supposed, perhaps in the first four or five years of life, and this is the period in which no one will question that the mother's influence is supreme. Home conditions during this period are therefore most vitally important for the future. I will not mention the obvious effects of sickness, crime, alcoholism, all of which go to make a sordid, wretched place for the child to grow up in, but call your attention to two matters of importance: child labor and employment of women. We cannot expect much of the generation, the children of which were brought up in the mines and factories. Child life that is deflected into hard labor and unsanitary health-destroying surroundings when it should be unfolding and developing character in school, home, and play must become deformed and stunted.

Tense industrial conditions have gone even further than placing the child at labor. The mother, too, has found her way in large numbers into the factories so that again the child is robbed of its own, and not only he but the generations to come must pay the toll of this greed of gold.

It has been shown that hard work by the pregnant woman tends to bring about miscarriages or if the child is born at term, to result in a poorly, undeveloped child. The energy which should have gone to the growing child has been deflected to the loom. Children born under such conditions must of necessity be seriously handicapped; they must find the difficulties of life often too great; so what wonder that later they break down, become insane, paupers, criminals, it matters not for all these are evidences primarily of mental defect, mental insufficiency, inability to meet life's problems. I am in hearty sympathy with laws governing child labor and the employment of women. The laws governing the employment of women that are in existence in most of the European countries seem to be well conceived. They provide for a certain number of weeks, both before and after confinement, free from labor with the salary continued. They are a healthy reaction against the too great individ-

ualism of the present day and an acknowledgment that we owe something to those others in whose society we live, and from which we derive so much. The day is past when the individual will be conceived to have the right to ruin as many souls and bodies as he wishes and then toss them ruthlessly aside on the dump heap of public charity for this and succeeding generations to care for.

Apropos of this question of the child and the home Miss Dorr* in a recent magazine article has emphasized the present condition of affairs by calling attention to the lack of provision for the child in the modern city. There is literally no place for him. There is no ground for play and many apartment houses even refuse families with children. Then again the conditions that used to maintain in the home have changed. In the old days the child not only could run wild in the woods but he was early initiated into some form of wholesome kraft work. Now it is the immense factory, and if the family be poor, both child and mother work there, while if they be rich or well to do, the child slowly becomes an artificial product of civilization with all the animal trained out of him, and neither he nor the mother have any from of wholesome physical occupation.

A great deal is said about the strenuous life of the present day as a cause of neurasthenia but my experience is that more people become nervous because they have nothing to do then because they have too much. The man is relatively well off and he may always have work to do, but for the middle class and well to do women there seems very little. Everything she needs can be supplied better and usually cheaper than she can produce it. With practically nothing to do, with time hanging heavily upon her hands, she ekes out a miserable existence of dreams that don't come true, of ambitions unrealized, of lack of fulfillment—in short, of failure. These are the potential neurasthenics and it is against this hopeless, useless existence that so many of our women have to lead that the so-called Suffragette Movement is to my mind a healthy reaction.

At this point I cannot fail to mention that recent development of the desire for race betterment—sterilization of the criminal. It is very hard to find any justification for such legislation unless it be the good intention back of it and you and I all know the fate of so many good intentions. The only basis on which I can conceive that such legislation might be founded is on that of the theory of unit segregation and gametic purity as set forth by followers of the Mendelian hypothesis. I have never heard the suggestion of any such reason, but even so, this theory has already been vigorously attacked, and there seems little warrant for such applications of hereditary principles except newspaper pseudo-science.

* Dorr, Rheta Childe: A Fighting Chance for the City Child. Hampton's Magazine, August (?), 1910.

The whole question of heredity is altogether too vague in its application to man to warrant any such radical measures. Perhaps the matter of heredity might be summed up best in the characteristic chapter heading of Ellen Key* in her admirable book "The Century of the Child" as "the right of the child to choose its parents." This is not a witticism but involves a fundamental privilege which is rarely consulted. How frequently in this super-sensitive civilization of ours are the rights of the next generation given consideration? How often is the bringing of a new soul into the world given as much consideration as the canary, or the selection of a suitable paper for the dining room? Why, we are not even permitted to talk of such things. A salacious prudery which fills columns of the public press with the description of the seduction of a young girl, insists upon a becoming modesty in such matters that relegates the question of human breeding to the back-ground, and places its morality in the cat and dog class.

It is well to keep in mind that the symptoms of that group of mental disorders comprised under the general term insanity are acquirements. Whatever potentialities the germ may have had these symptoms have been added to them and not developed as an innate necessity, at least in the special form they assume. The full possibilities of the influence of environment are only beginning to be appreciated. If a change in environment will actually change the shape of the skull, in one generation, as has been recently shown by Prof. Boas, what may we not expect from hygienic surroundings and proper educational methods?

But to revert to the question of education. Many of the psychoses that later go to the making of the classes of chronic insane, criminals, paupers, prostitutes, tramps, and ne'er-do-wells generally, begin early in life. They have their incipiency in the school-room and in the factory, they develop often under the very eyes of the teachers and, too, of the school and factory physicians. Our studies lead us to believe more and more that these psychoses are to a large extent preventable, yet they are only recognized when in full bloom and at a time when the possibility of applying preventive principles has long since past. They are not seen when in the making.

The reason for this failure to see the obvious is because of lack of training of teachers and physicians in what to look for. We see what we have learned to look for; few of us see anything else.

To say nothing of the pedagogic aspects of this state of affairs and the training of teachers, we may well inquire into the reasons for the neglect of psychiatry by our medical colleges. It is true that in the past few

* Key, Ellen: The Century of the Child. G. P. Putnam's Sons, New York and London, 1909.

years most of the medical colleges have added a course on mental medicine to their curriculum, but it usually consists only of a few didactic lectures, and almost always is considered as a sort of extra subject dealing with a department of medicine that the average practitioner will have little to do with. While interminable amounts of time are spent in discussing the appendix or the gall-bladder, the mind is almost totally neglected, and yet after all the object of life is a contented, peaceful mind—in short, happiness—to which the body is only secondary. The patient who consults a doctor does so because he is in pain, worried, unhappy, and yet pain, worry, and unhappiness are mental facts. What he really wants is peace of mind, to which the doctor contributes by making well again a sick body without, as a rule, appearing to realize that a mind has been involved at any point in the proceeding. How much we hear in our medical schools of pathology and how little do we ever hear of mental hygiene— of what Seneca has called the "business of a happy life." In this respect our medical courses are open somewhat to the same criticism as the miser. They fix their attention too much upon the means to happiness and in doing so often miss the goal by not using those means to purchase the desired thing.

In all preparations for life there is no suggestion that there is anything to be learned about self-knowledge, self-mastery; no suggestion that there is any light to be shed upon the problems that arise within one's self, that it is possible to direct the forces of our inner conflicts. We are not taught how to curb the hot bursts of passion by passing them in review under the scrutiny of the intellect, nor how to compensate for the sorrows of life by their sublimation through newly awakened interests. All these things are left to mere chance. We know much of the efficiency of engines under various loads, and thought and money unlimited have been spent upon making the necessary adjustments. But to the development of efficient mental mechanisms to meet the loads of adversity we devote hardly a passing thought.

Incipient mental cases in the community could be reached if a regular dispensary service were established as in other departments of medicine. Each municipal hospital should have its psychopathic ward to which patients could be admitted with no further preliminaries than are needed for admitting a patient to the general wards with, for example, a pneumonia or a broken leg. Each community should have also an after-care society for the purpose of caring for patients discharged from hospitals for the insane, and by helpful instruction and otherwise, attempt to establish them in the community, and prevent a recurrence of those conditions which before led to the mental break down.

A law was passed at the last session of the New York legislature that should interest all of us. It provides for taking out of the hands of the poor authorities the care of the insane previous to commitment, and putting it into the hands of the Health Officer. This is surely a step in the right direction. Not only are the insane cared for by the poor officers in many localities but quite as frequently by the police. I will not attempt at this time to dwell upon the abuses that have resulted as a consequence, but only emphasize the fact that the problem of insanity is a medical one from beginning to end and that it should be in the hands of medical men only. The segregation of an insane person should be considered as a quarantine measure and not dealt with from the standpoint of criminal law. When this is done, when the problem of insanity is definitely turned over to the medical profession, it will not be long before the value of preventive principles will be recognized and efforts made to put them in effect.

The practical things then that may be done at once in any community are these:

1. The securing of legislation that places the responsibility for the care of the insane previous to commitment in the local Health Office.

2. Every city of 100,000 inhabitants or over, should have a psychopathic ward connected with its municipal hospital which is as accessible for the mental case as the other wards are for general medical and surgical cases. This ward should have an out-patient department.

3. The organization of an after care society to assist persons who have been discharged from a hospital for the insane to get on their feet and to point out to them ways of avoiding the conditions which led to their breakdown.

4. The passage of adequate laws for the control of the labor of women and children.

5. Popular education. By the use of this term I am not merely dealing in a glittering generality that may mean nothing or everything. We have in this country nearly two hundred State Hospitals for the care of the Insane. These hospitals, each one of them, should be a center of information for the community in which it exists and its medical officers should use their positions to spread information about mental disorders. The Superintendent, or a member of the staff, should deliver one or more popular lectures each winter to which the public are invited. Much might be accomplished in this way if all hospitals would do this.

6. Field work from the State Hospitals and Psychopathic wards as centers to study conditions under which insanity has developed, to furnish assistance to the hospital in dealing with its patients, and to co-operate with the after-care society.

7. More liberal support by City and State, of scientific research work in this field especially along the lines of etiology and prophylaxis.

In this connection it may interest you to know that in 1906 there was organized at Milan an International Committee for the study of the causes and the prophylaxis of mental disorders. It is the object of this Committee to form an International Institute for the study of the causes and prophylaxis of mental disorders, and the King of Italy has consented to become the patron of this Institute. Nineteen countries sent official delegates to this Committee but as yet no one of them has made any appropriation to enable the work of the Committee to be carried forward.

The possibilities of the application of preventive principles in mental medicine are as broad as the multiplicity of human activities, as deep as the human soul. It has its medical, sociological, economic, legislative, pedagogic, and humanistic aspects. Of prime importance, however, is the recognition of the problem and to this end no one thing is more important, to my mind, than the inclusion in our medical curricula of a course in mental medicine that shall not be an unimportant secondary affair, but shall be on a par in extent and importance at least with the course in practice.

Twenty-five years ago a claim for the exaltation of mental medicine to a position of such importance might well have been criticized as unwarranted, but since then no department of medicine has advanced more rapidly or attracted a relatively larger number of able students. The advances in this field and the cognate subjects fully warrant such a claim. There is now such a mass of well established data in general psychology, child psychology, pedagogy, psychopathology, and the anatomy and physiology of the central nervous organs as to make it quite impossible much longer to resist the claim of mental medicine to its proper place in the medical curriculum and when that time comes the mind will be in a fair way to attract as much attention from the devotees of public health as does now the subject of infectious diseases. We will have learned that a healthy body is of no use to the individual or to society unless there dwells within a healthy mind. The maxim: "*Mens sana in corpore sano*," will still be true but in a sense amplified and vitalized.

Governmental Hospital for the Insane.

THE PREVENTION OF FEEBLE-MINDEDNESS.*

By E. R. JOHNSTONE,
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Under the gerneal heading "The Prevention of Mental Defects and Mental Diseases," the Secretary wrote me that my title would be "Imbecility."

I should like to change this word to "Feeble-mindedness." The desire for euphemism has within the past hundred years changed the generic term for people of this class from Idiot to Imbecile and from Imbecile to Feeble-minded.

Within the decade many of the institutions have divided their inmates into idiots (lowest), imbeciles (middle), and feeble-minded (highest), but this has led to a confusion of the specific and generic meanings of the word feeble-minded.

At the last meeting of the "American Association for the Study of the Feeble-minded," it tentatively agreed that the entire group should be known as the Feeble-minded. In the lowest grade is the Idiot, whose mental development will probably never exceed that of the normal child of about two years. In the middle grade is the Imbecile, whose mental development will probably never exceed that of the normal child of about seven years. In the highest grade is the Moron, (Webster's definition of a fool), whose mental development will probably never exceed that of the normal child of about twelve years.

"The terms already in use to express pathological and other definite characteristics such as hydrocephalic, mongolian, etc., may be used as prefixes or adjectives." I am using the term feeble-mindedness (imbecility on your program) in the generic sense.

One of the great problems of the last one hundred years has been to find the cause or causes of feeble-mindedness and the various writers have offered one reason or another, frequently giving percentages. So we have among the causes said to act:

* Read at 38th Annual Meeting of American Public Health Association, Milwaukee, September, 1910.

a. Before birth:

Heredity.
Tuberculous conditions.
Consanguinity of parents.
Alcoholism.
Youth or old age of parents.
Fright or shock to mother.
Mal-nutrition of mother.
Exhaustion of mother from child bearing.
Developmental—those coming to the surface in early childhood.

b. Those that are said to act at the time of birth:

Prolonged parturition.
Accident.
Premature birth.
Primo-geniture.

c. Those that are said to act after birth:

Traumatic cases.
Inflammatory diseases.
Toxic conditions.
Social conditions.

For many years we have been growing more and more suspicious of specific figures. That any or all of the above conditions may affect the case is undoubtedly true, but careful and detailed study of cases shows that in many instances it is impossible to tell whether the condition has induced feeble-mindedness or feeble-mindedness has induced the condition.

The English Commission after five years of investigation of the whole problem concluded that the first case in a family is sporadic but added—and this is the important fact—that once it appears it is easily passed from generation to generation.

I believe it is safe to stand with those students who speak of the insane, epileptic and feeble-minded; many of the tuberculous and alcoholic; the congenitally blind and deaf; some of the kleptomaniacs, recidivists, prostitutes, and sex perverts; a few of the tramps and paupers and particularly the semi-responsible mothers of illegitimate children; as belonging to a great neuropathic family who, themselves degenerates, bring into the world other degenerates.

As we study the history of the families of the children in our institution we find these neuropathic conditions occurring again and again, and throughout it all the conviction is borne in that heredity must claim by far the largest part of our attention if we are to check the stream of the feeble-minded which is undoubtedly growing from year to year.

Every effort must be made to prevent these conditions which tend to weaken the stock or make even a good environment useless. Alcoholics, syphilitics and tuberculous people should not attempt procreation. Troubles of sight and hearing should be corrected in so far as possible. The obstetrician should measure the pelvic outlet so as to be prepared for trouble if it is due to come. The environment must be the best possible but the real point of attack is the feeble-minded person who would become a parent.

Fourteen years ago Bicknell investigated 248 families, finding 887 persons of whom 63.2 per cent were feeble-minded. In 101 of these families feeble-mindedness was found in more than one generation.

Eight years ago Butler gives 803 families with 3048 members; of these 1594 or 52.3 per cent are feeble-minded and 38.3 percent are normal or unknown. Probably 52.3 per cent of the unknown ones are also feeble-minded.

In May of this year we compiled the statistics of the families of 77 of our pupils. These families were studied intensively—our field officers seeing personally practically all of the individuals reported.

In	6	families	where	the	father	only	was	feeble-minded	there	are	41	feeble-minded
"	15	"	"	"	mother	"	"	"	"	"	144	"
"	8	"	"	"	both	are	"	"	"	"	77	"
"	18	"	"	"	neither	are	"	"	"	"	90	"
Total	77	"									352	"

Among the relatives of these 77 children (including the parents) there are families with feeble-minded children as follows:

Father is feeble-minded, 14; mother feeble-minded 32; both feeble-minded, 16; neither feeble-minded, 51.

The	14	families	where	father	only	is	feeble-minded	have	only	40% normal.
"	32	"	"	mother	"	"	"	"	17.5%	"
"	16	"	"	both	are	"	"	"	0%	"
"	51	"	"	neither	are	"	"	"	56%	"

In 113 families having realtives in our school, numbering 495 members we are only able to find 177 or 35.8% apparently normal.

I wish to cite briefly a few families:

I. Maternal grandparents both feeble-minded with two feeble-minded daughters. No. 1 married a feeble-minded man. They have three feeble-minded children. She had an illegitimate son who is feeble-minded and criminal. Only one of this family in custody.

II. Grandmother feeble-minded. Her husband alcoholic, none of the children feeble-minded, although two had St. Vitus dance, one had hysteria

and one was alcoholic. Her daughter (mother of our child) married a normal (?) alcoholic man and they have three feeble-minded, two still-born, two miscarriages and two normals. The second and third daughters also have feeble-minded children. Only one of this family in custody.

III. Five feeble-minded children of this family are in our school. We supposed they were of three different families until our field officers investigated them. The father (alcoholic) of three of these, married for his third wife a feeble-minded prostitute with five feeble-minded brothers and sisters. She had had three feeble-minded children of whom he is supposed to be the father. After marriage they had three children all feeble-minded. This father deserted this third wife, married an alcoholic prostitute and is the father of still another feeble-minded child by a fifth woman who is feeble minded.

One more family. The oldest child is in our school. She has eight feeble-minded brothers and sisters. Her mother had children by four men, two of them feeble-minded. The mother's five brothers and sisters are all feeble-minded. Both of her parents were feeble-minded and her father had nineteen feeble-minded brothers and sisters. This father and grandfather were both feeble-minded. Five generations with this defect. 319 members traced and 119 of them feeble-minded, 42 normal and no data on 158. Plenty of alcoholism, syphilis, tuberculosis and crime. The study is not yet completed. Only one of the whole family in custody.

How shall we prevent feeble-mindedness? Let us stop speculating and gather facts.

In New Jersey, the Training School at Vineland has begun by putting at work four field officers* who, beginning with the child in the institution, go directly to the families, taking the latest news of the child. They go in a friendly spirit and ask all sorts of questions. They are frank and open about it and have been received with a cordiality that has amazed us. They ask about seeing other relatives but are more frequently referred to them. They see every case possible and they get results.

We are testing the whole plan out so if you have no institution in your state from which to start, try this plan which we are working successfully.

We have in our state a special committee which appointed itself. Then it got the State Charities Aid Association and the Commissioner of Charities to appoint it. It is called the Committee on Provision for the Feeble-minded and Epileptics.

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* Since this paper was written the State Reformatory, the State Institution for Feeble-minded Women and the State Village for Epileptics have each put a field officer on their family histories.

If you have no Board of Charities or Charities Aid get any society that will work to appoint one; preferably your State Medical Association.

We are asking every physician in our state for names and addresses of all feeble-minded and epileptics of whom they know. After we get through with them we'll ask the clergymen, then the school superintendents and then the lawyers. Fifty per cent of the doctors are replying with names. This should give us a pretty fair census.

You can start with the almshouse superintendents, the poor masters and the heads of the Institutions for the Insane or Incorrigibles. Get your field officers looking up their cases and you'll have arguments strong enough to move any legislature to appropriate money for institutions. We have three, a State Home for Feeble-minded Women, 200 inmates, a village for epileptics and feeble-minded men, 400 inmates; and a training school for feeble-minded children, 400 inmates.

In twenty-two years, $350,806 was appropriated for buildings and furnishings for the first two. (The third is a public charity, not belonging to the State.) This last year—since this committee has been at work $211,000 was appropriated and we've just begun. But remember the people want facts—not guesses. As soon as parents find that there is a possibility of having their children properly cared for and trained there will be many applications for admission to such an Institution.

The Committee is sending out 5,000 copies of the following report:

REPORT OF THE COMMITTEE.

The Committee began its work early in January, 1910, by sending to the parents or guardians of all of those applying for admission to the State Home for Feeble-minded Women, the Training School for Feeble-minded Girls and Boys, and the State Village for Epileptics, a letter requesting the names of all who were interested in the applicants.

Instead of merely sending us a list of names, most of the parents went personally and requested signatures, and in this way a real co-operation was secured with over 1200 business and professional men and women from all parts of the State.

Letters explaining the purpose of the committee, and the best way to assist were sent to all of these interested persons, and a great many of them replied telling what they had done. Their letters showed a real appreciation of the needs of the defectives and a desire to further their interests in every reasonable way.

Letters were sent to each member of the legislature explaining the condition in his county; and a table showing the number of applicants,

the number on the waiting lists, and the number eligible for transfer, by counties, was also sent. (Feeble-minded children are transferred at the age of 21 to the institutions for adults.)

A brief statement of the whole problem was sent to every newspaper in the State. Many of them published this statement, and some made favorable editorial comment.

The results are shown by the appropriation bills. For the State Home for Feeble-minded Women, the Supplemental Bill provides, in addition to other necessary things:

$1,000 for beds and bedding.
$3,000 for inside repairs, etc.
$5,000 for additional maintenance.

This will enable the State home to change some rooms, and provide for about forty-three women just as soon as the repairs can be made. This money is available at once. In the Regular Bill there is an appropriation of $50,000 for a new building. This sum will be available after November 1, 1910, and will provide a much needed hospital ward in the new building and living quarters for about forty women.

Feeble-minded women are now awaiting admission to the State Home as follows:

From the Training School	52
From the State Home for Girls	38
From various counties	22
	112

All of these cannot be taken at once, but plans for their reception are now under way, and it is expected that the forty-three most urgent cases will be admitted before the summer is over.

In the Supplemental Bill the Epileptic Village received no money which can be used to provide more room for patients, but in the Regular Bill, which is available November 1, 1910, they received:

For two buildings for epileptic patients	$60,000
For one building for feeble-minded men	45,000

Work on these buildings will begin as soon as possible after the money becomes available, but it is doubtful whether they can be ready for occupancy before the fall of 1911. A supplemental appropriation for maintenance must therefore be asked in March, 1911, so as to provide for these cases immediately upon the completion of these buildings. If

the plans and specifications are all ready by November 1, 1910, when this money is available, this work may be commenced promptly with the opening of Spring.

Special mention should be made in this report of the hearty co-operation of every member of the legislature in securing these appropriations, and particularly of the wise and considerate action of the members of the Appropriation Committee. For twenty-two years there has been provision made for an average increase of only twenty defectives per year. This legislature has provided for about 200.

The committee cannot speak too highly of the co-operation of those interested in the various applicants. They wrote letters to the members of the legislature and saw many of them personally, in some cases even bringing the needy child for personal observation, so that our law makers were entirely familiar with the problem of the feeble-minded and epileptic, and the needs of the individual cases. The Appropriation Committee visited the three institutions and saw in detail just what was to be done.

New Jersey is to be congratulated upon the judgment displayed by its representatives in this advanced step toward providing for its defectives.

Money expended for furnishings and buildings at the State Home for Women and the Epileptic Village as follows: Since 1888, $350,806.43. THIS YEAR, $211,000.00.

As the Training School for Children is not a State Institution, it cannot receive appropriations for buildings, etc. It only receives a per capita allowance for the State children sent to it. But increased accommodation in the State Institutions for men and women provides room by permitting the children's institution to transfer its adults to the State Home for Women and the men's departments at the State Village.

For the Committee,

E. R. JOHNSTONE, Secretary.

A few legislators objected to the parents taking feeble-minded and epileptic children into their offices and homes, especially when the epileptics had spasms there, but at least it accomplished results.

Perhaps you feel that I have not told you how to prevent feeble-mindedness. A few people say, put the ones we have painlessly to death. Of course civilized people will not agree to this. Two or three states have passed laws authorizing the unsexing of certain degenerates "after they get in institutions," but note—they have to get in the institutions first.

I heartily approve of the operation of castration and oophorectomy and merely agree to vasectomy and salpingectomy for want of something better, for after these operations have been performed a fair percentage of the cases may be returned with safety to their homes and thus make room for others in the institutions; but the ideal way is to gather all of the feeble-minded into institutions, and train them in so far as possible to be self supporting. Give plenty of industrial occupation and very little academic training. Thirty to fifty per cent can be made entirely self-supporting after ten years' training.

Take the women of child bearing age first and teach them to raise and can small fruits, raise poultry and garden truck, knit underwear, weave rugs, carpets, etc. Then take the others as young as possible and the economic problem comes close to solution.

But don't talk—get to work. The numbers are increasing. If you don't care for them in well conducted Training Schools where they may learn to contribute toward their own support you must keep them in almshouses, reformatories, prisons and other institutions and when they are led into evil ways you pay for their arrest, their trial and the damage they have done.

If feeble-mindedness is to be checked you personally must DO something.

DISCUSSION

DR. JOHN N. HURTY, Indianapolis, Indiana. Here it seems to me is the keynote of the whole subject of hygiene: What if we do save a child from diphtheria or scarlet fever and yet fail to save it from some neurosis? The child is lost just the same. It would be better for it to have died than to have saved it. What are these societies for? For the preservation of the child and the study of the child. The longer I live and work in hygiene the more I believe that among the children is the place to work. There is little hope to work with the adult. We must go back and study the child, we must instruct the child. We must make the child a good animal. That is what Herbert Spencer said. That being done, we have taken the first step. Under our present form of education we do not do this except to a limited degree, but it is gradually penetrating our minds that the child must be medically inspected, must have playgrounds and abundant fresh air. We have been shutting out the air from the school room and calling it economy. We have been buying sites for school houses without playgrounds and calling that economy, and it is the worst kind of extravagance. How do these economies and conservations impress the average business man? The business man is in the saddle. It is the business man who rules. He is our king. How can we get him to understand it is not economy to fail to provide children with playgrounds, to fail to provide medical inspection, to fail to do these things at the right time which are necessary to prevent disease and the neuroses? It is true that an eloquent orator can go before any legislature and make a plea for the poor insane, for men and women who have lost their minds. These people are deserving of pity and compassion. As the result of these appeals, the legislators will vote large sums for insane asylums. The State of Indiana has five insane asylums, the last having been built a short time ago, the cost exceeding a million dollars. Think of it—and now we have to build a sixth asylum! The business men should be made to understand that preventive medicine does prevent, and if you want to know how hard it is to impress upon the average business man the fact that prevention is better than cure, go before a business organization and read a paper like that which Dr. White has presented here, and I will venture to say that you will not make very much of an impression. And why? Because the business men are generally, though not always, impressed with the idea that they are the whole thing and that the medical man, especially the health man, is more or less of a crank. In my state,

Indiana, in making a plea for the inspection of school children, I said, "Let us have the teeth of the children fixed so that they can eat, and be properly nourished. Let us remove their adenoids so that they can breathe freely and develop properly." For proposing this, newspaper men and business men, have denominated me a crank, and they call us all cranks for proposing these economic, rational, business-like and scientific measures.

It has been said that we are engaged in the greatest work that is possible, but do the business men so understand it? No, they do not. They do not attend these meetings. They do not hear; they do not listen. I once visited a rich and influential business man and asked him to help in the fight against tuberculosis. A contribution was requested and he was urged to join the tuberculosis society, so that it could be said that they had practical business men engaged in this work. He replied "No, I cannot join the tuberculosis society. Individual effort does not appeal to me, but I will give you a contribution." That, of course, was a good act in itself, but he would not join the society himself. In three years from that time his daughter died from tuberculosis. During that period he had a chance to study tuberculosis and to know that it was a preventable disease. He understood it as never before. He called at my office two months after her death and said, "Do you remember when you came to me and asked me to help you in the cause of tuberculosis? I told you I did not have time to help in this work. My daughter is now dead from tuberculosis and I have an abundance of time to work in this cause." See how we are constituted. It was necessary for death, for disaster, for sorrow, to come into his life before that man could take up this work. We cannot get men to look at this matter in the right light and take hold of this work with us. We must make them understand that we must do something to prevent this eternal building of insane asylums. If any of you wish to go into philanthropy, if you wish to do something for the American people, if you wish to improve business, do something for the little children.

DR. NORDEN, of Sturgeon Bay, Wisconsin. Aside from trying to make a living in the practice of medicine, I have been riding a hobby—the education of children. There is one feature which has struck me rather forcibly, and that is the neurotic conditions of children that are superinduced by night studies. For this we should not blame the teachers, nor should we blame the school boards. I am a member of a school board myself, and know their troubles. We should blame the people who prevent the school board from doing what they should do. It is absolutely necessary, the way education is carried on these days, that the child must study at

night or he must sacrifice the play-time of the day. It is almost impossible for most children to study in school while one section of the school room is reciting. I have suggested frequently in my work that we cut down the number of hours of school sessions. If we use the school session for the recitations and explanations only, and allow the rest of the day to be used partly for pleasure and partly for study, it would be a good thing. In this way we cut down the period of confinement and also give the child plenty of time to study during daylight. We thus prevent neurotic conditions that are produced by night studies. I merely offer this as a suggestion. It may be a new thought to some of you and I hope you will take it home with you and discuss it more fully at the next meeting.

DR. HUGHES. The attitude of the average business man toward public health affairs is one of indifference, to say nothing of his ignorance on the subject. Business men are beginning to understand the value of saving by-products. In the coal tar business, look at the number of by-products saved. Take the raising of cotton and see how the cotton seeds are made into meal and oil. Mr. Cooper, the great New York philanthropist, made an immense fortune by taking the refuse of boneyards and converting it into glue. We should not allow people to become broken down with neuroses, with mental aberrations, dementia, idiocy, imbecility and other consequences of neurotic degeneration, because when they are thus broken down they are thrown into the scrap heap and ash piles of human action where they are forgotten.

We have lunatic asylums and places for idiotic and other forms of mental derangement. People do not try to save themselves so much as they ought from developing these neuroses, but they learn to save the scraps in their businesses. This is the indictment I bring against the average business man; namely his indifference and the fact that he neglects to save his own kind, not only after they become neurally broken down, but he neglects to save them by providing those means which an enlightened profession has pointed out for generations as the method by which human organic neurotic salvation, to say nothing of spiritual improvement, may be accomplished. Some of them listen to prayers and to preachers on spiritual salvation, overlooking and neglecting sanitary salvation. We plead for brain and mind and nervous system salvation of humanity. Salvation, like the waters of life, may be drunk freely in the light of our modern gospel of health. Whosoever will may have sanitary salvation for his offspring if he will take the matter under proper consideration and choose the right parentage and grand-parentage for the child to be conceived and born. Lunatic asylums, asylums for idiots, homes for the

feeble-minded and the deaf and dumb, are monuments largely to the error of unhealthy selection. We will obliterate them when we shall have wisely and physiologically obliterated the causes of human degeneracy by sane and sound mental selection of the progenitors of the generations.

DR. A. C. ROGERS, Faribault, Minn. Dr. Johnstone has presented some startling facts concerning some sources of supply for the New Jersey Institutions for Feeble-Minded and Epileptics. What is true of his state is very generally true of every commonwealth. There are two sources from which defective children spring: First, good families, free so far as appears from any pronounced blood taint. These sporadic cases, it is fair to presume, will always be found, unless biology shall finally discover where the error lies and teach the remedy. Second, families in which are pronounced defective or neurotic strains. It is from these latter that a very large number of the inmates of institutions for feeble-minded and epileptics, many cases in hospitals for insane, as well as a good percentage of the inmates of our reformatories and penal institutions, are derived.

The attitude of the nineteenth century has been one of solicitude for the care and betterment of the individuals of these classes. The twentieth century will mark a growing demand for prevention. Human life, however, is too complex a matter, the modus operandi of its genesis too completely shrouded in mystery, to promise rapid and certain revelations sufficient to insure the universal production of perfectly mental and moral human beings at any time in the near future. There are, however, a few guide boards along the way that, heeded, will lead toward the desired goal. Just at the present time we need facts, perhaps, more than anything else—that is, facts concerning the family history of definite concrete cases with their places in their respective families. The investigation should be broad in its scope, not limited to an occasional family, but including any family in which two or more defective or delinquent members are found. This work could be done upon the initiative of state institutions by an enlargement of their functions or by the creation of a commission of capable men (or men and women). In either case the first need is ample facilities for field work by well trained, capable, patient and tactful agents. The next requirement is a careful classification and analysis of results to bring out the relationship of the various forms of mental defect and delinquency to the neuroses, and the location of the most vicious blood strains. With this information the subject of prevention can be taken up with more hope of reaching some valuable practical conclusions.

SANITATION OF BAKERIES AND RESTAURANT KITCHENS.

By CHAS. B. BALL,
Chicago, Ill.

The anti-tuberculosis propaganda which has characterized the beginning of the twentieth century has produced in the mind of the public at large some consciousness of the evils attendant upon a lack of light and ventilation in living rooms and workshops and has directed attention incidentally to the disadvantages of underground stores and habitations. Notwithstanding these results of the campaign against the "Great White Plague," the conversion of existing cellars and basements into underground stores and shops, and the location of various business undertakings in basements of new buildings is still going on in all the large cities without any organized attempt on the part of health officers to stem this tide of cellar occupation. The experience of three years past in Chicago justifies the conclusion that an initial effort may well be directed against cellar bakeries and restaurant kitchens. The awakening of a desire for clean food, which has been manifested in federal and state legislation, affords in every community a sound basis for vigorous attempts to restrict the establishment of new underground installations of this character and to effect the closing of the worst of those now existing in cellars.

The principal motive for such a movement is not, however, the desirable end of increased purity of the food products of bakeshop and kitchens, but rather the protection of the health and lives of the "slaves of civilization" who are condemned to labor under insanitary conditions comparable only to such as prevail in the holds of ships.

We shall first discuss the baker and the bakery, and later consider some application of the principles laid down to underground kitchens.

From the time (1670) when Ramazzini wrote on the diseases of bakers and evils of night work, and pointed out the high mortality of bakers in cities, a long line of Continental and English investigators have agreed that the occupation of the baker predisposes to acute rheumatism, stomach disorders and diseases of the respiratory system. Those authorities are fully set forth by Dr. Frederick L. Hoffman* in a monograph on "Mortality from Consumption in Certain Occupations," and need not be noted in detail here. Referring to the studies by Dr. Zadek of Berlin in 1896,

* Bulletin of the Bureau of Labor, No. 82, May, 1909, pages 518–537.

Hoffman says: "A wealth of statistical data derived from various sources is considered in the discussion, all of which may be summed up in the statement that the evidence is entirely conclusive that the occupation of baker, unless subject to strict sanitary supervision, is decidedly prejudicial to health."

In considering the incomplete data available for the United States, especially the mortality among bakers and confectioners reported from the registration states for 1900, he asserts that "The general conclusions of foreign authorities are, however, strictly applicable to American conditions, and they may be summarized in the statement that the continuous and considerable inhalation of flour dust is injurious to health and a predisposing factor in the mortality from consumption and from respiratory diseases generally." He pleads for "a further and more thorough investigation into the mortality of this occupation as a most valuable contribution to industrial hygiene."

All investigators of this subject unite in attributing a baneful influence to the cellar locations occupied by bakeshops. The proportion of underground shops has always been large, especially in cities. In Chicago, in 1907, the number was 582, constituting 43% of all establishments. In a large majority of these the air was foul, the lighting bad, the floors and walls dirty and the plumbing fixtures ill-kept.

From our experience in dealing with these unfit locations, 282 of which have been discontinued in compliance with orders from the Department, we are moved to note the disadvantages incident to underground bakeries, especially to such as are in cellars having a ceiling at about the level of the ground, as follows:

1. The lack of sufficient natural light is one handicap of the cellar bakery. Besides the frequent experience that a location depending solely upon artificial light is more than apt to be found dirty, the hygienic value of sunlight, even when diffused, in decreasing the viability of pathogenic bacteria, is well established. General Sternberg's statement that "sunlight is one of the most potent and one of the cheapest agents for the destruction of pathogenic bacteria," meets the approval of, and is expressed in almost the same language by Newman, Frankland, Rosenau and other writers on the subject. The late Prof. Charles Harrington, writing generally of the value of light in factories, remarks "Although good light may not be a necessary factor in all the various kinds of work, and poor light may not always lead to injury, the effect of well lighted rooms, if only to exert an unconscious influence upon the minds and spirits of the workers, is highly desirable as a concomitant factor in the maintenance of health." This well known stimulating effect of a sunshiny room upon the spirits of

the workmen is possibly lessened by the practice of operating bakeries at night. Such night operation will be greatly restricted, we believe, in the course of time, as it now is by law throughout the Kingdom of Italy.

2. A second disadvantage of the cellar bakery is the increased difficulty of adequate ventilation because of its location below the ground level. If the means of ventilation are natural ones only, depending upon air curremts through doors and windows, the location of these openings below the surrounding ground surfaces almost precludes any useful effect from them. As compared with like results of air flow by natural causes through similar openings above the ground, they are almost negligible. If mechanical means of ventilation are resorted to, the obstacles encountered in preventing the entrance of dust, etc., from the streets and alleys, are almost insurmountable, and can only be overcome by locating inlets above the ground or by providing expensive air cleaning apparatus.

3. In this connection may be noted the increased liability to contamination of bakery products both before and after passing through the oven, by the entrance of dust laden street air. Professor Harrington has well said that "a cellar is not a suitable place for handling dough, jellies, food, cream, etc., which go to make up food products, particularly on windy days in summer when the sidewalk windows permit ready entrance of street dust into the chocolate and cream fillings, the lemon and apple pies, as not infrequently has been observed." Although the danger of infection from dirt blowing from the outside into unbaked bread and pies may be less than that of infecting such food by contact with the floor after baking, it is none the less to be avoided as an undesirable factor of food production.

4. A substantial disadvantage of a cellar bakery, often overlooked and sometimes even misconstrued as an advantage, is the decreased radiation of heat through the lower walls of the building as compared with upper walls exposed to air currents. While the general fact that a cellar is cool in summer is unquestioned, it is also well ascertained that when the oven of a bakery is fired, the slight radiation of heat through the cellar walls and the surrounding ground with which the masonry is in contact results in abnormally high temperatures in the cellar room.

5. The underground bakery is likely to have insufficient and incomplete drainage on account of its location. In Chicago, flooded bakery floors have been common for years past and have resulted often in the making of food under disgusting conditions of filth. Coupled with inadequate drainage in a cellar, is the increased tendency to dampness with its consequent damaging effects on the flour and meal stored for use.

6. One of the serious dangers attendant upon cellar bakeshops is the increased danger from undiscovered fires which threatens the safety of persons living in upper stories of the same building. This evil has not in Chicago been emphasized as it has been in New York City, where large sums have been expended in providing fire resisting construction between bakeries in the cellar and living rooms in upper stories. This legislation does not allow any openings whatsoever to be maintained in the floor of the first story. While our Chicago situation doubtless requires attention from this point of view, the danger is less threatening on account of the fact that few of our buildings containing bakeries are over three stories high and most do not exceed two stories.

7. The entrance of rats and other vermin is encouraged by underground locations and their eradication rendered much more difficult than when the floor is at or above the surface.

Let us now proceed to note the five principal structural requirements which are indicated for bakeries hereafter established:

1. The floor should be at or above the ground level. Although there is not at the present time, so far as we are advised, any law which requires a bakery to be placed wholly above the ground, it appears that the considerations which have been urged against cellar bakeries will, in the near future, be held to be of sufficient weight to require this important advance as to location. As a practical matter of design, where a building is erected on a costly site, it is a prime requirement that the principal floor be on, or only slightly above, the level of the street. As soon as it is conceded that the floor of a new bakery shall not be more than five feet below the street (the requirement of the Wisconsin law and our Chicago ordinance), it will, in the more difficult cases, be brought at least to the height of the street grade.

A recent decision of the Supreme Court of Wisconsin in the case of Benz & Nakielski versus the State Bakery Inspector, is worth noting in this connection, not only on account of the strong terms in which it upholds the reasonableness of such a restriction applied to bakeries as that the floor shall not be more than five feet under ground, but as well on account of the broad ground taken with respect to the application of the police power; the court holding that "individual cases cannot determine the necessity of classification. The question is, whether in general the public health will be promoted by the rule and not whether isolated cases do not need such a rule. If the rule be in the interest of the public health, it must be general and well within the class controlled by it."

2. The lighting and ventilation should be effected by windows placed on at least three sides of the bakery. If a skylight be practicable, it may

replace windows on the third side, provided the windows which remain are in opposing walls of the room. Any less favorable plan will fail to secure adequate natural ventilation. Windows should open on spaces at least ten feet in width and should have their sills no nearer to the ground than four feet, a height sufficient to escape the entrance of most of the dirt blown about by the surface air currents. The tops of windows should be kept as close to the ceilings as convenience of design will permit.

3. The floors should be rat and moisture proof. There is little objection to the use of a hardwood wearing surface over a concrete floor structure, although the best types of monolithic floors are better than any wooden floor.

4. The best wall finish is hard and smooth cement plaster painted with enamel paint. Ceilings should be of the same material or may be sheathed with steel over a hard vermin-proof plastered surface. The use of whitewash for wall or ceiling coating is now recognized as undesirable since its surface is always rough, dust catching, and liable to flake.

5. An important feature consists in arranging all the furniture and equipment so that it may readily be moved away from the wall, or to a new floor location, when the surfaces are to be cleaned or repainted. Fixed wooden shelving, immovable troughs and tables, do not allow proper maintenance of walls and floors.

Passing now to the consideration of restaurant kitchens, particularly those situated in cellars, let us note that the administration of the restaurant control ordinance passed in July, 1906, was mainly concerned at the outset with the quality of the food supply. Our inspectors found rotten meat in the ice boxes, spoiled canned goods in the store rooms, rat runs in the vegetable bins and cockroaches everywhere. After a few months insistent action by the Department and consequent steady improvement in these conditions, attention was directed to structure and ventilation as well as maintenance. All the disadvantages observed in cellar bakeries were found commonly present in restaurant and hotel kitchens. Besides these were found the added evils of very cramped working spaces, clouds of steam from cooking and dishwashing operations, very high temperatures near the boilers and ranges and accumulations of garbage and trash in close proximity to the prepared food stuffs. Such defects in structure were found, as floors consisting of a number of layers of saturated boards, soot blackened paper hanging from walls and ceilings, wood tables and meat blocks with wide cracks containing decomposing grease deposits, cellar windows and vault openings through which street dust sifted into food ready for the table and toilets and locker rooms not properly shielded to afford protection to the food in preparation.

Our experience with these foul catacombs leads to the conclusion that new installations of restaurant kitchens, in addition to the provisions suggested for bakeshops, require attention to the following:

1. Ample space must be provided in which the employes may perform the various operations. The contingency of expansion at a future date should be considered, as the tendency to enlarge the dining room, without providing additional kitchen facilities, is found in a great many cases.

2. The arrangement of the various appliances in their relation to each other should insure the isolation of dishwashing and garbage storage from the handling of food.

3. Adequate provision must be made for the removal of cooking odors, not alone from the ranges, but also from vegetable boilers, so as to avoid nuisance in other parts of the building and in the neighborhood. The Underwriters' Association now requires that ventilation ducts from large ranges be built of heavy iron plate and carried through the top of the building without other connections, so that the grease and soot may be burned out of them as from a chimney flue, without incurring fire danger to other rooms.

4. Ample toilet facilities and wash rooms, separate for each sex, and apart from those provided for the public, must be furnished. The wash basins should be loacted outside of the toilet rooms in order that it may be apparent to those in charge that the hands are cleansed after leaving the toilets.

5. Proper locker rooms, with exceptional means of ventilation, must be provided in order to avoid the nuisance of the storage of either street or working clothes in tightly closed cupboards.

6. Well ventilated refrigerators are required in numbers sufficient to afford a separation for the different classes of food, especially for milk and butter.

The best examples of the application of these rules of design to new bakeshops and kitchens are to be found in the upper stories, preferably the top story, of certain high buildings. Such installations of superior type are at present by no means rare.

It may be pertinent to this discussion to inquire what influences in the community will give support in cases of official action for the suppression of these submerged nuisances.

We do not need to predict that all the bakers, cooks, waiters and scullions will show a lively interest in efforts made to improve conditions which mean death or life to them. As regards the customer or consumer, he needs only the pointing hand of authority to suggest which establishment should be patronized and which avoided by him. The proprietor

will require for his conversion, argument, persuasion and sometimes the strong hand of the law. It is by no means easy to convince him that success in his business depends upon the restoration of public confidence in his plant and his products. The property owner will at first bluster about vested interests and his right to lease his cellar, as heretofore, whether it be suitable or unfit, for food production uses. After consultation with his lawyer, he will express sympathy with the progressive attitude of the authorities and a desire to make any changes they may suggest to make his building acceptable. When advised that no changes are practicable, he will remonstrate, but will shortly acquiesce in the decision. The legal obstacles interposed to the execution of laws aimed against underground occupation will be less formidable than anticipated. No lawyer in his right mind will, after careful consideration of the present scope of the police power, advise a client to oppose the will of the people in this regard. Judges and juries affected by the current wave of interest in public health, will prove sympathetic with the reform. Above all other sources of encouragement, the newspapers, quick to note the public pulse, will respond, both in news and editorial columns, with hearty endorsement of the movement.

It is not too much to hope, or indeed to prophesy, that within the life span of a generation, the industries of food making will cease to inhabit caverns and dungeons of the earth and will come to the surface to be carried on amid appropriate surroundings of daylight and fresh air, without which the normal human existence and day's work is impossible.

SAVING CHILDREN FROM MILK-BORNE DISEASES.*

By NATHAN STRAUS.

The old city of New York (now the Borough of Manhattan), has established a new record in the saving of the lives of babies. Notwithstanding unusually severe periods of intensely hot weather the past summer, there have been fewer deaths of children under five years than in any preceding summer, and for the first time in the history of the city the summer mortality has fallen to a rate less than fifty per thousand per annum.

When I first undertook to protect the babies of New York from milk-borne diseases by supplying pasteurized modified milk in 1892, the summer saw the dying of 6,612 children under five years, making the rate per thousand per annum 136.1. With the steadily increasing use of pasteurized milk there has been a steady decline in infant mortality, until the summer just ended showed only 3,900 deaths in a population of children larger by 125,000 than that of 1892.

In other words, in 1892, 964 children out of every 1,000 survived the summer, while in 1910 there were 988 who escaped death out of each thousand.

That the pasteurization of milk fed to children has been a considerable factor in this achievement none may deny, for the prevention of sickness and death proceeds inevitably from the destruction of the germs that cause illnesses and that slay the little ones.

These facts are too elementary to be recited before the American Public Health Association. They are set forth fully in the thorough exposition of the milk problem by the Federal Public Health Service in the Bulletin, "Milk and Its Relation to the Public Health," which Surgeon General Wyman summarized in the words, "Pasteurization prevents much sickness and saves many lives."

This epitome of the results of the Federal Milk Investigation ought to be the battle cry of the forces united in the warfare against preventable diseases. Of all preventable diseases the most prevalent are tuberculosis, typhoid and scarlet fevers, diphtheria and the intestinal disorders of infancy; the specific germs of each may be and often are transmitted to the human system in raw milk, and these germs are rendered harmless by proper pasteurization.

* Read at 38th Annual Meeting of American Public Health Association, Milwaukee, September, 1910.

We ought to recognize that the disease now attracting so much attention—infantile paralysis—has all the appearance of a germ disease, occurs among infants whose only food is milk, and is probably prevented by pasteurization. I venture this presumption because of the fact that this disease has never occurred among the babies fed upon the milk pasteurized at my laboratories. I submit this fact in the hope that this practical experience may be used to the protection of child life while scientists are engaged in the tedious effort to isolate the germ.

If resort to pasteurization precedes scientific justification in the case of infantile paralysis, this method, as applied to the diseases known to be milk-borne, follows and confirms the discoveries of science.

My recent experience at Sandhausen, Germany, may be cited. The death rate among babies under two years of age had averaged 46 per cent for five years. I pasteurized the milk for most of the babies, and the death rate fell to less than 20 per cent. I pasteurized the milk for all the babies of the village, and last July there were no deaths at all.

Again at Karlsruhe, instead of 26 per cent of the babies dying in a year, the rate was reduced to 16 per cent by pasteurization of the milk fed to about one-fifth of the whole baby population. These children were of the poorer classes, among whom the death rate had been higher than the average for the city. After these babies had been fed upon pasteurized milk the death rate among them fell to less than seven per cent.

All of which confirms and emphasizes the warning uttered by the eminent Prof. Jacobi at a meeting of child-saving agencies at the New York Health Department last spring. He had listened to the broaching of various ideas that had been put forth for approval of the conference. The most important thing, said the greatest authority on the care of infants, is this: "Use no raw milk."

There is no division of science upon this point. No competent authority has ever disputed the fact that pasteurization kills the germs of disease, while it in no way impairs the nutritive value or the digestibility of the milk.

My practical experience in saving children from milk-borne diseases warrants the assertion that the pasteurization of the milk supplies of our big cities, under careful Health Department supervision, would infallibly reduce the number of cases of infectious diseases and save lives of babies.

In no way could the American Public Health Association save so many mothers from bitter grief and loss of their little ones as by hastening the time when efficient pasteurization will be the rule and when the milk-borne diseases will be as rare as the plagues that medical science has practically abolished.

Section of Municipal Health Officers

THE TRAINING OF JANITORS IN SANITARY CARE OF SCHOOL PREMISES.*

By Dr. HELEN C. PUTNAM,
Providence, R. I.

The Department of Science Instruction of the National Education Association during the recent meeting at Boston appointed a committee of three to report on suitable methods of securing sanitary care of school premises through the training of janitors. An advisory committee of experts in sanitation is associated.

Vital statistics of tuberculosis among teachers, and data from autopsies, X-ray and tuberculin tests concerning tuberculous lesions among children are ample reasons in themselves, if there were no others as unfortunately there are, for training competent care-takers of schools, where law compels children to congregate, and where the country's health habits and health ideals are formed.

Standards of school cleanliness should equal those of the best hospitals and private homes. The factor in school environment most completely under control of school authorities that most affects efficiency both at school and in future life is schoolhouse air. The official having direct and continuous charge of the air is the janitor who has to deal with details of dust, humidity, temperature and effluvia. This responsibility is given to those who make no pretense of fitting for sanitary duties or inspection; who do the best they know how with picked up knowledge.

Teachers are usually expected to report neglected details to the principal who is nominally responsible for sanitary conditions. All good housekeepers know that such matters require persistent following up of the worker. Thus the teacher must "nag" the principal and "tell on" the janitor, both usually men with no training beyond what unstandardized experience has given them. Teachers can hardly be blamed for neglecting this thankless task that creates hostility and jeopardizes their positions while probably not securing the results desired.

* Read before the Section of Municipal Health Officers of the American Public Health Association, Milwaukee, Spetember, 1910.

When janitors have the management of high pressure engines, engineer's licenses are required. A few cities have civil service examination for janitors, chiefly relating to their common education and previous experience. Massachusetts has civil service examinations that in sanitation are practically nominal, as few men eligible in other respects apply, and there are no provisions for instruction in sanitary care of schools. In consequence the appointing of janitors from civil service lists is fallen in discredit among many school officials who find experienced janitors more satisfactory.

The training and testing of care-takers of school premises is, however, as logical and imperative a need as is that of teachers, nurses, librarians, drug clerks; or of housekeepers, cooks, and other domestic workers, rapidly coming to pass. It is a vital factor in problems of school hygiene, and is likely to be the most effective means of educating other school officers in sanitation. Salaries paid janitors in large cities, ranging from $700 to $2500 and $3000, average higher than salaries of teachers, post-office employes, or assistant librarians, the formalities of whose appointments are well known.

Courses for janitors can be introduced in trade or technical schools, vocational or continuation schools. During the coming winter one or more biologists, possibly other science instructors also, and possibly one or more boards of health are planning experiments in talks, demonstrations, and other methods with classes of janitors.

Studies of schoolhouse air show humidity often nearer 20% than the normal 40%; temperatures are more often in the 70's and 80's than in the healthful 60's; carbon dioxid, indicating animal exhalations, more often measures 20 parts in 10,000, i. e., technically bad air, than the normal 4 in 10,000; anemometers prove many ventilating flues out of order through neglect. Dust, foul floors and air, which are the rule, are what no good home maker or hospital official would tolerate.

Meanwhile a very few schoolhouses, even in "soft coal cities," by no means the most expensive structures, have floors as clean as the home or hospital; a few others are practically free from dust; a few others have good air; a few schoolrooms have temperature at 68 degrees or below, with red cheeked pupils and teachers, who become depressed and dull in warmer air when it accidentally exists.

Such schools and schoolrooms prove the possibility of achieving each of these results even in buildings that are not equipped with elaborate and expensive heating and ventilating apparatus that forbids opening windows and is frequently out of order. Open air schools are likewise demonstrating the wholesome reaction of children to cool air of sufficient humid-

ity and comparatively free from dust and effluvia. In them delicate children invariably make more rapid progress mentally as well as in health.

Among the teachers of janitors it is desirable to include instructors from schools for nurses and domestic science, as the service required is technical and practical, to be held to definite standards which thus far have been best demonstrated in these two lines of education. In addition, health officers, biologists, and instructors in physics and chemistry can be of service in creating standards and testing results. It is also important to secure the co-operation of these men and women in establishing classes for janitors on a permanent basis in the right educational institutions.

Every large city has several hundred janitors, not of schools alone, but of apartment houses, office buildings, theatres, churches and entertainment halls; also Pullman porters, train and street car conductors, hotel managers. With different grades of examination as in the United States postal service, this course can be adapted to each form of custodial care.

We are seriously afflicted by unsanitary public buildings (including schools) and conveyances. The public good demands that educational and health standards be introduced in these important occupations that have been mentioned.

It is a hopeful sign that the National Education Association has taken a so evidently practical first step in school hygiene. The co-operation of health officials will encourage further undertakings. The committee will greatly appreciate any information concerning sanitary care of school premises; it will be of special value in the discussion at the annual meeting next summer at San Francisco.

On July 13th, 1911, a session will be given to two topics: I. Assuming that schools should be not less wholesome than the best kept homes from which pupils are taken: What are permissible limits of variation in sanitary details that may be under teachers' advisement or control (dust, temperature, odors, cleanliness, light, humidity, for example)? How are such standards determined? How are such details to be conveniently measured as heat is measured by a thermometer? II. By whom and how should janitors be trained and tested in sanitary care of school premises?

The committee's indebtedness for any co-operation will be acknowledged in its report.

Feb. 21st, 1911. H. C. P.

Laboratory Section

ELECTROLYTIC PRODUCTION OF SODIUM HYPOCHLORITE.*

By CHARLES POTTER HOOVER,
Assistant Chemist, Water Purification Works, Columbus, Ohio.

So much has been said and written about the use of hypochlorite, and so many cities and towns have adopted it for disinfecting their water supplies, that we seem to be living now in the age of hypochlorite.

From the very beginning of this movement many chemists and engineers have felt that the public would object to the application of bleaching powder to their water supply, and also knowing some of the disagreeable features incident to its use, felt that the very unique and attractive method of passing an electric current through salt water would not only overcome all aesthetic objections to the disinfection of public water supplies, but would offer a clean, cheap and attractive method of purification.

Calcium hypochlorite, the active constituent of bleaching powder, has, however, been almost universally adopted in preference to the sodium-hypochlorite produced electrolytically, for the reason that no electrolyzer has been put on the market that has proven itself successful from an economical standpoint, for water purification at least, and any new process, no matter how ingenious or unique, must be able to produce a better product, or the same product at a less cost, before it can hope to supplant older and tried out methods.

Charles Watt was the first chemist to discover (1851) that hypochlorite solutions could be produced by electrolysis. The electrolytic production of hypochlorite then remained dormant until 1884. Since that time a number of cells have been developed, but the original reactions and principles are the same as patented by Watt and the electrolyzers that have been developed since differ only in points of construction.

There are two general types of electrolyzers for dissociating sodium chloride. In one the cathodic and anodic products are allowed to recombine in the main body of the electrolyte and in the other, known as the diaphragm process, the products are removed separately from the cell as produced.

* Read before the Laboratory Section of the American Public Health Association, Milwaukee, September, 1910.

For the production of sodium hypochlorite the non-diaphragm process has been considered best because it dispenses with the destructible diaphragms and the loss of energy that all such diaphragms occasion.

As previously stated the hypochlorite cells differ only in matters of construction and may be described as follows:

The bath is divided into compartments by numerous electrodes with small spaces between them, through which the salt solution is made to circulate. Each set of two electrodes becomes a cell, and the vat a battery of cells. By adopting this chamber arrangement or multipolar electrode arrangement, hypochlorite electrolyzers can be built to utilize almost any current conditions that are available. For instance, if a dynamo of 220 volts and 25 amperes is at one's disposal 50 electrode plates can be employed, forming 49 cells. In each cell there will be a tension of 4.5 volts and a current of 25 amperes will pass; thus the action of a current of 4.5 volts and 1225 amperes will be attained.

When a direct current of electricity is passed through a solution of sodium chloride, sodium is liberated at one pole and chlorine at the other. The liberated sodium reacts on the water breaking it up into hydrogen and hydroxyl ions to form sodium hydrate. The sodium hydrate in turn combines with the chlorine to form sodium-hypochlorite. (Na O Cl.)

There are however, many side reactions taking place and what actually happens in the electrolytic production of sodium hypochlorite solutions is about as follows:

First, electrolysis of sodium chloride with formation of sodium-hydrate, hydrogen and chlorine. Second, formation of sodium hypochlorite, by action of chlorine on sodium hydrate. Third, formation of sodium chlorate by oxidation of sodium hypochlorite. Fourth, electrolysis of sodium hypochlorite and chlorate as soon as they begin to be present in appreciable amounts. Fifth, the reduction of the sodium hypochlorite by the action of hydrogen produced at the cathode. Here we have the electrical energy impressed on the electrolyte first consumed in oxidizing chloride to hypochlorite and subsequently reducing it again to chloride, the net result being the conversion of electrical energy into heat, heat favoring the formation of chlorates.

The side reactions make it difficult to build high current efficiency cells.

Two methods have been suggested for preventing the oxidation of the hypochlorite to chlorate.

First, by keeping the electrolyte at a very low temperature.

Second, Lunge* has suggested that enough sodium, calcium or magnesium hydrate be added to absorb and utilize the excess chlorine usually found in electrolyzed salt solutions, since the presence of free chlorine is favorable to the conversion of hypochlorite to chlorate.

A method for checking the reducing action of hydrogen on the hypochlorite is described in an English patent. The electrolyte is made by adding to every 14 liters of 10% salt solution, 40 grams of calcium chloride, 30 grams of lime and 50 cc. of a strong solution of resin in caustic soda. In this way, a film, probably calcium resinate, is formed on the cathode and hinders the hydrogen from acting on the hypochlorite.

In the electrolytic dissociation of sodium chloride there is a definite minimum voltage required for carrying out the reaction, and this voltage figured according to the thermochemical equation is computed to be 2.3 volts, but Lunge† has shown that in the production of sodium hypochlorite where the chlorine formed at the anode combines with the sodium hydrate formed at the cathode, the calculation is different and the minimum theoretical voltage required to carry out the reaction is 3.54 volts.

Taking this minimum theoretical voltage required to bring about the desired reactions, one kilowatt gives 282 amperes. One ampere hour is theoretically capable of producing 1.32 grams of chlorine, so that 1¼ kilowatt hours are necessary to produce one pound of available chlorine. This represents a process of 100% efficiency on both current and energy basis. One pound of available chlorine represents the dissociation of 1.6 pounds of salt. (Na Cl.)

Placing a value of two cents per kilowatt hour on the current, and assuming the cost of salt to be three pounds for one cent, the cost of one pound of available chlorine would be a little more than three cents. One pound of available chlorine as bleaching powder costs in the market from 3.5 to 4 cents.

The electrolyzers that have already received industrial trial have shown very low efficiencies.

Roscoe and Lunt‡ discuss in detail the results obtained by electrolyzers that had received industrial trials up to 1895.

According to their figures:

The Corbin	cell	showed	an	energy	efficiency	of 21%
The Hermite	"	"	"	"	"	23%
The Kellner	"	"	"	"	"	25%
The Woolf	"	"	"	"	"	31.5%
The Vogelsang		"	"	"	"	35.5%

* Journal Soc. of Chemical Industry. 1885. page 722.
† Sulphuric Acid and Alkali. Lunge. Vol. 3. page 637.
‡ Journal Soc. of Chemical Industry. 1895. page 24.

Taking the best of these we find that with the current costing 2 cents per kilowatt hour one pound of available chlorine would cost 5.5 cents for electrical energy alone.

Among the more recent cells that have attracted some attention are the Dayton Cell and the Hass-Oettel. The first is described by Rickards* and his most favorable results show that one pound of available chlorine can be made with 2.62 kilowatt hours of current and 6.9 pounds of salt. These figures were obtained by keeping the electrolyte at a very low temperature by means of ice. Without the cooling process 3.62 kilowatt hours and 7.2 pounds of salt were necessary.

With the second cell Duckworth† was able to make one pound of available chlorine using 2.84 kilowatt hours and 11 pounds of salt.

In our own experiments and in the practical operation of the cells that have been subjected to practical tests, it has been necessary to use an electromotive force of 4 to 4.5 volts to carry the current through the salt solution. On account of the side reactions involved current efficiencies have been low, and owing to the fall in efficiency which accompanies the proportion of hypochlorite present in the electrolyte, the resultant liquid always contains large quantities of sodium chloride in its original form and rarely more than 18% or 20% of the chlorine present in the form of chloride is converted into hypochlorite. Even though a cheap current is available, further salt savings than have yet been secured are necessary, before electrolyzers, in which the recombination of the anode and cathode products take place in the main body of the electrolyte, can compete with calcium hypochlorite.

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* Quarterly Bulletin Ohio State Board of Health, Oct.-Dec., 1909.
† Soc. of Chem. Industry. Nov., 1905.

AN EMERGENCY HYPOCHLORITE PLANT.*

By H. A. WHITTAKER and J. A. CHILDS,
Minnesota State Board of Health.

During the past two years the hypochlorite treatment of water has rapidly come into use. The results secured in various sections of the country seem to point to treatment with this disinfectant as a very satisfactory method of sterilizing most public water supply. In Minnesota calcium hypochlorite has been used in several instances with success. The small amount of apparatus required and the low cost involved in purifying large amounts of water has made this method especially desirable. This makes it possible to install small plants quickly, thus rendering this treatment applicable to the disinfection of infected water supplies. In localities where the epidemiological and analytical evidence points to a contaminated water supply as the cause of an epidemic, sterilization of the water is necessarily the best means of preventing further infection. In such cases immediate sterilization is necessary as it is impossible to prevent a certain percentage of the population from drinking the water even with the most efficient publicity on the part of local health departments.

The only means of protecting those who disregard the orders of the health department or who fail to learn of the infection of the supply is to render it potable as soon as possible.

Whenever it has been necessary to install an emergency hypochlorite plant in the small municipalities of this state the time required has usually consumed the greater part of a week and in some cases has been even longer. This delay is usually caused by lack of material with which to properly construct the apparatus necessary to administer the chemical. This gives opportunity for further exposure to infection. After actual experience of such delays in installation, the idea suggested itself to one of us (H. A. W.) that a small emergency plant could be constructed and kept in readiness by the State Board of Health. Such a plant could be transported by express to any municipality in the state within a period of 24 hours and could in most instances be installed and in operation within 48 hours. This saving in time would undoubtedly result in the prevention of a number of infections. This plan of constructing and keeping constantly on hand a portable emergency hypochlorite plant was pre-

* Read before the Laboratory Section of the American Public Health Association, at Milwaukee, September, 1910.

sented to the Minnesota State Board of Health at a recent meeting. The construction and maintenance of such a plant was authorized and designs are in course of preparation by one of us (J. A. C.) along the following lines:

Briefly this plant will consist of the following parts: Mixing tank, storage tanks and administering device.

The mixing tank will be about 30 inches in diameter and of equal depth. A conical chamber is placed inside of the tank, with its small end fixed about an inch from the bottom. A propeller is made to revolve within this conical chamber which causes the solution in the tank to circulate through the cylinder in either direction as desired, thus securing rapidly a uniform solution.

From the mixing tank the solution is drawn into the storage barrels which are two in number and used alternately. These storage barrels are of about 50 gallons capacity.

From the storage barrels the solution is fed into the administering box in which a constant level is maintained and from which the solution is fed to the water supply at the desired rate.

It is estimated that this plant will easily treat a water supply at the rate of one million gallons per day, which is about the maximum consumption of most of the smaller municipalities of Minnesota.

As the plans of the plant are now being drawn, it is impossible at this time to present a sketch, but the complete description will be published later in some engineering journal.

A REPORT ON THE HYPOCHLORITE TREATMENT OF WATER AT MINNEAPOLIS.*

By Dr. J. F. CORBETT, Bacteriologist.
Minneapolis, Minn.

The object of this report is to colaborate a large amount of data concerning the physical, chemical and biological properties of the water before and after treatment with hypochlorite. From the mass of collected data, it was hoped that some rule might be deduced to determine the amount of chlorine necessary to sterilize water of varying composition. In reviewing the results of 300 chemical and 5000 bacteriological analyses, no definite formula for the use of hypochlorite could be established. There is no absolute ratio between the albuminoid ammonia, the bacterial count, the temperatures of the water, or any other chemical ingredient. Further than this, it was hoped that a careful record of the size of the suspended matter contained in the water might give some clue as to the theoretical amount of chemical to be used. From the table appended, it is apparent that there is a general ratio between the figures expressing the extent of these masses and the amount of chemical required for sterilization.

The amount of hypochlorite used in this plant has been experimental—that is, the least amount that would destroy all colon in the water. During a period of twenty-four hours, it was found that at times much less hypochlorite was required than at other times, probably due to variation in the physical constituents of the water. In running the plant, sufficient chemical was used to destroy the colon bacilli at the most refractory period. In the table is given the average of the analyses for each month before and after treatment, together with the amount expressed in terms of "available chlorine" in parts per million used. It will be noticed that there was a decrease in albuminoid ammonia after treatment with hypochlorite. The reduction varied at different times. In May it was necessary to use 3.04 parts per million available chlorine to destroy the colon, with an average reduction of albuminoid ammonia from .240 to .152; in June 2.94, with a reduction of from .331 to .153. In July only 2.45 parts per million of chlorine were required to reduce a higher albuminoid ammonia—3.98 to 3.50 parts.

There is shown a rise of four parts per million in the alkalinity following treatment. The chlorine is increased from four-tenths to one-tenth of

* Read before the Laboratory Section of the American Public Health Association, at Milwaukee, September, 1910.

one part per million at the end of 20 minutes, and 2 parts at the end of 48 hours. The color and odor was not affected.

The change of inorganic residues is probably due to a varying amount of sedimentation that occurs in the fore-bay just before the water is pumped. No apparent decrease in the organic residues is demonstrable. This may be due to the physical state of much of the suspended matter. Large masses occur in the raw water that escape in the analyses. These masses are ground up by the pumps and appear in the analyses of the treated water.

In order to make clear the time at which these samples were taken, a slight description of the plant is necessary. The capacity of the plant is forty million gallons per day. This water is taken from the Mississippi River by two pumping stations. The hypochlorite is added before the water enters the pumps so as to insure thorough mixing. Chemical and bacteriological analyses were made of the water as follows: First, twenty minutes after treatment; second, as it enters the reservoir at the inlet; third, as it leaves the reservoir, or outlet; and fourth, examination was made at the tap in the central laboratory of the Minneapolis Health Department. Two hours are required for the water to reach the reservoir, and thirty-six hours for the water to find its way to the outlet.

From the bacteriological returns it may be seen that during the winter months—February and March, when the reservoirs are frozen over, either as the result of low temperature or as a result of having closed reservoirs, the action of the hypochlorite extended to the time that the water was delivered to the pipes. On the other hand, in the summer months, the action of the hypochlorite is much more rapid, and is thoroughly exhausted before leaving the reservoir.

ANALYSES OF MISSISSIPPI RIVER WATER BEFORE AND AFTER TREATMENT WITH VARIOUS AMOUNTS OF BLEACHING POWDER EXPRESSED AS PARTS PER MILLION AVAILABLE CHLORINE.

COLOR				TURBIDITY			
Month	Raw	Treated	Parts per Million Chlorine Used	Month	Raw	Treated	Parts per Million Chlorine Used
Feb.	30		1.34	Feb.	2		1.34
March	40		1.68	March	10		1.68
April	45	40	2.01	April	10	5	2.01
May	45	45	3.04	May	5	5	3.04
June	34	31	2.94	June	10	5	2.94
July	28	27	2.45	July	15	5	2.45
Aug.	23	23	2.37	Aug.	5		2.37

FREE AMMONIA				ALBUMINOID AMMONIA			
Month	Raw	Treated	Parts per Million Chlorine Used	Month	Raw	Treated	Parts per Million Chlorine Used
Feb.	.155		1.34	Feb.	.200		1.34
March	.027		1.68	May	.180		1.68
April	.070	.067	2.01	April	.260	.200	2.01
May	.067	.051	3.04	May	.240	.152	3.04
June	.046	.029	2.94	June	.331	.153	2.94
July	.039	.040	2.45	July	.398	.350	2.45
Aug.	.093	.093	2.37	Aug.	.382	.300	2.37

ALKALINITY				CHLORINE				
Month	Raw	Treated	Parts per Million Chlorine Used	Month	Raw	Treated		Parts per Million Chlorine Used
Feb.	182		1.34	Feb.		A.	B.	1.34
March	130		1.68	March	1.1			1.68
April	140	146	2.01	April	1.3	1.7	3	2.01
May	144	148	3.04	May	1.6	1.7	4	3.04
June	155	159	2.94	June	1.7	1.8	4	2.94
July	161	163	2.45	July	1.5	1.7	4	2.45
Aug.	165	169	2.37	Aug.				2.37

A—At end of 20 minutes. B—At end of 48 hours.

INORGANIC RESIDUES				ORGANIC RESIDUES			
Month	Raw	Treated	Parts per Million Chlorine Used	Month	Raw	Treated	Parts per Million Chlorine Used
Feb.	122		1.34	Feb.	51		1.34
March			1.68	March			1.68
April	99	101	2.01	April	86	80	2.01
May	120	135	3.04	May	83	94	3.04
June	110	113	2.94	June	97	97	2.94
July	112	110	2.45	July	83	83	2.45
Aug.	114	113	2.37	Aug.	90	92	2.37

BACTERIAL COUNT IN MISSISSIPPI RIVER WATER

Month	River	Lab.	Inlet	Outlet	Tap	Parts per Million Chlorine Used
Feb.	207		220	187	72	1.34
March	1100	365	133	98	87	1.68
April	8000		1200	1750	2800	2.01
May	7500	520	600	1250	1250	3.04
June	6000		274	1700	1110	2.94
July	6000		1090	3400	1200	2.45
Aug.			213	3290	2000	2.37

MICROSCOPIC ORGANISMS, RAW WATER

April	165
May	236
June	131
July	138
August	205

SIZE OF SUSPENDED MATTER, RAW WATER

April	15
May	18
June	17
July	14
August	14

THE RESISTANCE OF CERTAIN BACTERIA TO CALCIUM HYPOCHLORITE.*

By F. F. WESBROOK, H. A. WHITTAKER, B. M. MOHLER.

In the treatment of Mississippi River water with calcium hypochlorite, it is found impossible at times to get complete sterilization even by the addition of large amounts of this disinfectant. The presence after treatment of a residual bacterial count caused the writers to conduct certain laboratory experiments with the raw river water. These experiments included the application of various amounts of the chemical to determine the resistance of the common forms of bacteria present.

The complexity of the problem of estimating the results of treating the raw water increases directly in proportion to the number of varieties of the organisms present. It seemed wise therefore, to simplify the problem by studying the effect of the treatment of water artificially infected with a pure culture of a given bacterium and to study in this way a number of different varieties and strains. The organisms selected were those isolated themselves from water or which, although obtained from other sources, are frequently found in water. It was felt that when the strength of the chemical necessary to produce complete sterility had been ascertained, and the effect of time, temperature and other such variables had been noted for a number of different bacteria and strains studied independently, it might prove simpler to gain some idea of the processes which occur in the treatment of waters naturally or artificially infected with combinations of the same organisms.

The experimental work on individual organisms, described in detail in the body of this paper, includes the treatment in pure culture of a resistant spore former isolated from the river water, and also cultures of *B. coli* and *B. typhosus*. The work on *B. coli* and *B. typhosus* later developed into a comparative study of the resistance of different strains of these bacteria in pure culture isolated from divers sources.

METHODS OF PREPARATION AND TREATMENT OF RAW WATER AND PURE CULTURES.

The water used in these experiments was collected without treatment from the Mississipi River at Minneapolis. That used for the suspension of pure cultures was sterilized by passing it through a Pasteur filter. The

* Read before the Laboratory Section of the American Public Health Association at Milwaukee, September, 1910.

sterile filtrate was inoculated in bulk from 24 hour agar slants of the organism to be treated and placed in 200 cc. amounts in 300 cc. sterile flasks. The calcium hypochlorite solution was then added in amounts necessary to treat the water with a definite quantity of chemical. An untreated control was run with each experiment. The amounts of calcium hypochlorite added are expressed in parts per million of available chlorine. Agar plates were made from these flasks at set intervals, to determine the amount of disinfection in a given time. The largest amount of any sample plated for a bacterial count was 1 cc. and dilution for high counts was made whenever necessary. The flasks were kept at room temperature during the experimental work and the minimum and maximum temperature noted. The bacterial counts were made after 24 hours incubation of the plates at 37.5° C.

THE TREATMENT OF RAW MISSISSIPPI RIVER WATER.

The results secured by treating raw Missippi River water with various amounts of calcium hypochlorite are included in Tables 1, 2 and 3. The bacterial count in the untreated water used in Table 1 was low, yet in no instance was complete sterility reached within a period of 17 hours.

Tables 2 and 3 on samples of river water collected on different dates again show that complete sterility is not secured with the application of the amounts of chemical indicated. These tables also show that the count is at first materially lowered, after which a marked rise is indicated. This is illustrated in Table 2 on the 49 hour count and in Table 3 on the 24 hour count. The amount of chemical necessary to materially lower the bacterial content under conditions indicated in Table 1 is 0.17 parts per million of available chlorine, and an appreciable reduction is noticed with 0.034 parts. The marked reduction in Tables 2 and 3 appears to take place with amounts from 0.5 to 1.0 parts per million.

THE RESISTANCE OF A SPORE BACILLUS ISOLATED FROM MISSISSIPPI RIVER WATER.

The treated water in Tables 2 and 3, after the rise in count had occurred, was examined, and the predominating organism, practically in pure culture, was found to be a spore-forming bacillus. The characteristics of this organism are given later in this article.

The presence of these spore-bearing bacteria in the treated samples suggested spore formation as the means of preservation of this organism.

In order to test its resistance to calcium hypochlorite, it was treated in pure culture as indicated in Table 4. The method of treatment was

identical with that given heretofore in the general description under the treatment of pure cultures. The culture was, however, a mixture of a 24 hour and a six day agar slope. In this way a culture was secured containing an abundance of active bacilli and also a large number of spores. It appears from the results in Table 4 that a reduction in count follows treatment, which is probably due to the extermination of active bacilli, the spores remaining uninjured. The spores present in the treated water thus continued to develop when plated on the agar and are probably not exterminated unless germination takes place before the hypochlorite has been rendered ineffective by liberation or chemical combination.

THE RESISTANCE OF VARIOUS STRAINS OF B. COLI AND B. TYPHOSUS.

For this work, six different strains each of *B. coli* and *B. typhosus* were selected from laboratory cultures. All cultures were carefully tested and corresponded with the morphological and cultural characteristics of these organisms. The typhoid cultures responded also to the agglutination test.

As indicated, Tables 5 to 12 inclusive are on the treatment of *B. coli* cultures and Tables 13 to 19 inclusive on the treatment of *B. typhosus* cultures with calcium hypochlorite.

In order to have a comparative test of the resistance of the two organisms, cultures of colon and typhoid were treated at the same time and under identical conditions. The results expressed in the following tables were secured as described. (Table 6 with Table 13, Table 7 with Table 14, and Table 8 with Table 15.) A study of the tables indicates a variation in resistance to the chemical of the two organisms and even of the different strains of the same organism, which, however, should be studied further. The differences in resistance is better shown in Table 20, which compares the minimum amount of chemical necessary for extermination in the minimum time tested. Further tests should be made upon a fixed basis of time of exposure. In the comparison of Table 6 with 13 and Table 7 with 14 more chemical is required to produce sterility in the typhoid than the colon suspension, while in Table 8 as compared with 15 the colon requires the greater strength. Colon cultures in Tables 9, 10 and 11, and the typhoid cultures in Tables 16, 17 and 18, were treated at different times but under very similar conditions, the only variation being a slight difference in temperature. The results should therefore be comparable.

On examination of the tables just mentioned and Table 20—the summary—it is again evident that the amount of chemical necessary for

extermination of different cultures is a variable quantity. In order to treat cultures of typhoid and colon acclimated to a water existence rather than cultures sown directly from agar slants, the sterile water to be treated was inoculated separately with these organisms and allowed to stand for three days before applying the chemical. This method of procedure should afford a race of organisms actually born in the water, thereby more nearly approaching conditions in nature. Table 12 and Table 19 show the results secured by such treatment. On comparing the results with the former treatment of these cultures in Tables 10 and 15, it appears that the colon culture remains unaltered while the resistance of the typhoid has been reduced materially. The treatment here, as in those experiments just mentioned, is comparable in all tests with the exception of a slight difference in temperature.

The results as already stated show that different amounts of chemical are required to sterilize for different cultures and strains of both colon and typhoid. The minimum amount of chemical required in the minimum time tested for *B. coli* is from 1.5 to 3+ parts and for *B. typhosus* from 1 to 3 parts per million of available chlorine.

It appears in a general way that the sum total of amounts of calcium hypochlorite required to exterminate both organisms is about the same, yet in the selection of individual cultures considerable variation in the amounts actually required is indicated. The sum total of these results indicates in a very general way that we may be warranted in still using the presence or absence of colon bacillus in a water supply as our guide to the possible presence or absence of typhoid infection until such time as a more accurate laboratory test is available. The final check, however, on the value of the colon test in water disinfection will be the epidemiological data collected on typhoid infected water supplies before and after treatment.

SUMMARY AND CONCLUSION.

1. On treating the Mississippi River water even with large amounts of calcium hypochlorite it was found impossible to effect complete sterilization.

2. The predominant organism remaining after treatment was found to be a spore-bearing bacillus.

3. Treatment of this organism in pure culture has demonstrated a great resistance of certain spore forming bacteria to this chemical, which may be one of the factors, if not the most important one, in the failure to produce complete sterility, and is probably the cause of the later rise in bacterial count after treatment in certain of our experiments.

4. Results on the comparative treatment of *B. coli* and *B. typhosus* in pure culture show in a general way that the sum total of amounts of calcium hypochlorite required to exterminate both organisms is about the same, yet in the selection of individual cultures some variation in the amounts actually required is indicated. The results further demonstrate in a general way that pending the formulation of better technical methods we may continue to regard the presence or absence of colon bacillus in treated waters as the index of possible infection with, or freedom from, the typhoid organism.

5. It is hoped that investigations may soon be undertaken in this country or abroad which will seek to determine the effect of the variable factors responsible for variations in efficiency of sterilization procedures in which hypochlorites are employed.

These will doubtless include the study of the effect of organic materials in solution and suspension and other physical and chemical variations in the waters treated as also the nature, number and varieties of the organisms present in the solution, to which latter problem these experiments are a slight contribution.

The organism showed the following morphological and cultural characteristics:

Morphology—

Bacilli: size 1.2:5.7, μ; form—round, long rods; spore germination—terminal; staining reactions,—Gram negative, Loeffler's alkalin methylene blue, positive.
Motility: sluggish, progressive.

Cultural Features—

Agar stroke: growth—moderate, beaded, flat, glistening, white, opaque, correacious; odor—absent.
Agar stab: growth—uniform, filiform, tendency to beading.
Agar plates: growth—slow, colonous, round; surface—smooth, granular; edge—entire.
Potato: growth—scant, spreading, some beading, dull white.
Broth: no surface growth, moderately cloudy, viscid, some flocculence.
Litmus milk: acid, prompt reduction and coagulation, slowly peptonized.
Gelatine: growth best at top, liquification stratiform.

Physical and Bio-Chemical Features—

No production of indol in muscle-sugar-free broth.

TABLE 1. TREATMENT OF MISSISSIPPI RIVER WATER COLLECTED FROM MINNEAPOLIS CITY SUPPLY.

Available Chlorine p. p. m.	Bacteria per c.c. 17 hours exposure.					
	Date 12-1-08 Temp.19°-21° C.	Date 12-12-08 Temp.19°-5.5° C	Date 12-14-08 Temp.16.6°-19°C	Date 12-26-08 Temp.21°-18° C.	Date 1-4-09 Temp.18°-22° C.	Date 1-8-09 Temp. 19°-23° C.
0	325	190	164	127	186	118
0.017	..	..	..	..	140	..
0.034	..	..	..	..	72	80
0.068	..	..	..	..	..	70
0.085	..	..	..	..	60	..
0.136	..	..	..	..	..	70
0.170	..	..	..	..	10	..
0.272	..	..	..	..	..	10
0.340	..	..	..	..	1	..
0.408	..	..	..	..	..	8
0.510	..	40	7	6	..	..
0.544	..	..	..	..	..	1
0.680	..	37	9	5	2	2
0.850	20	37	11	18	..	..
1.700	8	23	16	2	..	..
2.125	10	..	..	..	..	..
3.400	..	20	12	3	..	..
4.250	1	..	..	..	..	..
8.500	2	..	..	..	..	..

TABLE 2. TREATMENT OF MISSISSIPPI RIVER WATER COLLECTED DIRECTLY FROM RIVER AT MINNEAPOLIS, MARCH 15, 1910.

Available Chlorine p. p. m.	Time Exposed (Temp. 18°-23° C.)						
	30 Min.	2 Hr.	3 Hr.	4 Hr.	25 Hr.	40 Hr.	73 Hr.
0	12,000	9,600	9,800	10,000	350,000	18,400	21,000
0.10	14,000	9,400	9,600	10,500	340,000	230,000	23,000
0.25	12,000	5,300	4,600	6,500	290,000	600,000	200,000
0.50	5,800	850	250	500	11,000	250,000	260,000
0.75	850	40	50	60	70	97,500	240,000
1.00	275	30	30	100	55	4,000	260,000
2.00	54	150	10	30	40	3,100	160,000
3.00	50	20	30	25	40	16,000	130,000
4.00	36	0	40	150	50	3,100	80,000
5.00	80	70	30	70	5	4,100	70,000

TABLE 3. TREATMENT OF MISSISSIPPI RIVER WATER COLLECTED DIRECTLY FROM RIVER AT MINNEAPOLIS, AUGUST 8, 1910.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-26° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	230,000	200,000	160,000	150,000	140,000
0.5	14,000	7,400	2,000	6,000	11,000
1.0	20	14	170	450	60,000
1.5	10	6	16	45	70,000
2.0	7	8	10	97	70,000
2.5	7	14	30	110	65,000
3.0	6	12	5	12	16,500

TABLE 4. TREATMENT OF SPORE BACILLUS ISOLATED FROM MISSISSIPPI RIVER WATER.

Available Chlorine p. p. m.	Time Exposed (Temp. 21°-24° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	3,500	3,500	3,500	3,200	2,100
0.5	3,700	2,400	2,400	3,800	3,000
1.0	1,300	2,200	2,600	3,600	1,800
1.5	2,400	2,300	3,000	1,100	1,400
2.0	2,800	2,400	1,700	1,200	1,800
2.5	2,500	2,300	1,200	1,200	1,900
3.0	2,300	1,100	1,300	1,200	2,200

TABLE 5. TREATMENT OF B. COLI CULTURE No. 1 ISOLATED FROM MISSISSIPPI RIVER, OCTOBER 22, 1909.

Available Chlorine p. p. m.	Time Exposed (Temp. 25°-25° C.)				
	45 Min.	1 Hr. 45 Min.	2 Hr. 45 Min.	5 Hr.	24 Hr.
0	5,500	6,100	5,600	5,300	13,000
0.10	9,900	9,300	9,200	7,500	44,000
0.25	9,800	7,000	8,300	6,700	18,500
0.50	3,300	4,500	4,600	5,800	4,700
0.75	16,600	7,700	4,800	7,000	15,500
1.00	1,700	6,800	4,900	4,600	11,000

TABLE 6. TREATMENT OF B. COLI CULTURE No. 1 ISOLATED FROM MISSISSIPPI RIVER, OCTOBER 22, 1909.

Available Chlorine p. p. m.	Time Exposed. (Temperature 22°-25° C.)			
	50 Min.	2 Hr.	4 Hr.	27 Hr.
0	1,200,000	1,700,000	1,100,000	1,800,000
1	30,500	1,300	80	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
10	0	0	0	0

TABLE 7. TREATMENT OF B. COLI CULTURE No. 2 ISOLATED AT AUTOPSY APRIL 4, 1910, FROM BLOOD IN HUMAN HEART.

Available Chlorine p. p. m.	Time Exposed (Temp. 23°-26° C.)				
	30 Min.	2 Hr.	4 Hr.	27 Hr.	75 Hr.
0	56,000	140,000	71,000	18,500	35,500
0.75	35,000	5,200	20	0	0
1.00	32,000	4,600	0	0	0
2.00	0	0	0	0	0
3.00	0	0	0	0	0
4.00	0	0	0	0	0

TABLE 8. TREATMENT OF B. COLI CULTURE No. 3 ISOLATED AT AUTOPSY, NOVEMBER 17, 1908, FROM HUMAN PERITONEUM.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-25° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	170,000	170,000	170,000	150,000	2,000
0.5	160,000	110,000	30,000	30,000	140
1.0	65,000	60,000	8,400	3,000	10
1.5	38,000	7,000	0	0	0
2.0	25,000	10	0	0	0
2.5	700	30	0	0	0
3.0	10	0	0	0	0

TABLE 9. TREATMENT OF B. COLI CULTURE No. 4 ISOLATED NOVEMBER 17, 1908, FROM HUMAN BLOOD CULTURE.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-25° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	71,000	110,000	89,000	87 000	91,000
0.5	44,000	27,000	5,900	80	2
1.0	15,000	450	0	0	0
1.5	5,000	0	0	0	0
2.0	140	0	0	0	0
2.5	60	0	0	0	0
3.0	15	0	0	0	0

TABLE 10. TREATMENT OF B. COLI CULTURE No. 5 ISOLATED FROM MISSISSIPPI RIVER WATER, JUNE 23, 1910.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-26° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	51,000	37,000	33,000	23,000	0
0.5	17,500	190	0	0	0
1.0	2,600	0	0	0	0
1.5	0	0	0	0	0
2.0	0	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 11. TREATMENT OF B. COLI CULTURE ISOLATED FROM MISSISSIPPI RIVER WATER, JUNE 23, 1910.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-26° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	41,000	34,000	33,000	23,000	0
0.5	26,000	3,700	0	0	0
1.0	7,500	0	0	0	0
1.5	0	0	0	0	0
2.0	0	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 12. TREATMENT OF B. COLI CULTURE No. 5 ISOLATED FROM MISSISSIPPI RIVER WATER, JUNE 23, 1910.

Available Chlorine p. p. m.	Time Exposed (Temp. 23°-28° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	2,000,000	2,500,000	2,900,000	3,100,000	5,400,000
0.5	1,320,000	914,000	67,000	20,000	16,000
1.0	90	80	20	10	5
1.5	0	0	0	0	0
2.0	0	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 13. TREATMENT OF B. TYPHOSUS CULTURE No. 1 ISOLATED SEPTEMBER 3, 1909, FROM HUMAN BLOOD CULTURE.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-25° C.)				
	50 Min.	2 Hr.	4 Hr.	27 Hr.	75 Hr.
0	15,500	1,700	1,000	0	0
1	170	55	0	0	0
2	100	10	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
10	0	0	0	0	0

TABLE 14. TREATMENT OF B. TYPHOSUS CULTURE No. 2 ISOLATED JANUARY 23, 1910, FROM HUMAN BLOOD CULTURE.

Available Chlorine p. p. m.	Time Exposed (Temp. 23°-26° C.)				
	50 Min.	2 Hr.	4 Hr.	27 Hr.	75 Hr.
0	61,000	55,500	54,000	240,000	1,000,000
0.75	64,500	43,500	53,500	220,000	650,000
1.00	40,500	53,000	47,000	140,000	600,000
2.00	30,500	400	0	0	0
3.00	0	0	0	0	0
4.00	0	0	0	0	0

TABLE 15. TREATMENT OF B. TYPHOSUS CULTURE No. 3 ISOLATED AT AUTOPSY OCTOBER 15, 1908, FROM HUMAN HEART BLOOD.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-25° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	24,000	22,000	16,000	14,000	13,500
0.5	18,500	18,000	15,000	13,000	10,000
1.0	10,500	4,000	0	0	0
1.5	250	0	0	0	0
2.0	0	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 16. TREATMENT OF B. TYPHOSUS CULTURE No. 4 ISOLATED AT AUTOPSY NOVEMBER 17, 1908, FROM HUMAN SPLEEN.

Available Chlorine p. p. m.	Time Exposed (Temp. 21°-26° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	89,000	88,000	93,000	91,000	51,000
0.5	78,000	62,000	61,000	16,000	0
1.0	3,900	0	0	0	0
1.5	550	0	0	0	0
2.0	325	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 17. TREATMENT OF B. TYPHOSUS CULTURE No. 5 ISOLATED AT AUTOPSY DECEMBER 19, 1908, FROM HUMAN SPLEEN.

Available Chlorine p. p. m.	Time Exposed (Temp. 22°-25° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	93,000	97,000	43,000	55,000	2,000
0.5	14,000	0	0	0	0
1.0	0	0	0	0	0
1.5	0	0	0	0	0
2.0	0	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 18. TREATMENT OF B. TYPHOSUS CULTURE No. 6 ISOLATED DECEMBER 25, 1909, FROM HUMAN BLOOD CULTURE.

Available Chlorine p. p. m.	Time Exposed (Temp. 20°-22° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	310,000	290,000	270,000	160,000	50,000
0.5	190,000	160,000	110,000	11,000	18,000
1.0	190,000	110,000	88,000	42,500	1,600
1.5	54,000	0	0	0	0
2.0	0	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 19. TREATMENT OF B. TYPHOSUS CULTURE No. 3 ISOLATED AT AUTOPSY, OCTOBER 15, 1908, FROM HUMAN HEART BLOOD.

Available Chlorine p. p. m.	Time Exposed (Temp. 23°-28° C.)				
	30 Min.	1 Hr. 30 Min.	3 Hr.	6 Hr. 30 Min.	24 Hr.
0	250,000	340,000	360,000	370,000	310,000
0.5	4,600	0	0	0	
1.0	0	0	0	0	0
1.5	0	0	0	0	0
2.0	0	0	0	0	0
2.5	0	0	0	0	0
3.0	0	0	0	0	0

TABLE 20. SUMMARY OF TABLES ON RESISTANCE OF B. COLI AND B. TYPHOSUS SHOWING THE MINIMUM AMOUNT OF CHEMICAL REQUIRED TO PRODUCE COMPLETE STERILITY IN THE MINIMUM TIME EXPOSED.

B. Coli				B. Typhosus			
Table No.	Culture No.	Time Exposed	Available Chlorine p. p. m.	Table No.	Culture No.	Time Exposed	Available Chlorine p. p. m.
6	1	50 min.	2	13	1	50 min.	3
7	2	50 "	2	14	2	50 "	3
8	3	30 "	3*+	15	3	30 "	2
9	4	30 "	3*+	16	4	30 "	2.5
10	5	30 "	1.5	17	5	30 "	1.0
11	6	30 "	1.5	18	6	30 "	2.0

* In these two treatments 3 pts., the maximum amount used, did not produce sterility in the time indicated in this table.

Notes and Reviews*

MUNICIPAL SANITATION NOTES.

CHARLES V. CHAPIN,
Providence, R. I.
(*Reviewer.*)

Relation of Flies to Disease. Hamer (Report of the Medical Officer of Health of the County, London, 1909, Appendix IV) has pursued his investigations on this subject, and continues to urge caution, as does his chief, Sir Shirley Murphy, in accepting the relation between flies and disease as established. He calls attention to the fact, that in London, in 1907 and 1909, the fly curves corresponded almost exactly, while the curves for diarrhea showed a marked contrast; that for 1907 only slowly attaining its maximum towards the end of September, while in 1909 it reached its maximum in August. He also notes that although both the diarrheal diseases and typhoid fever are alleged to depend, so far as their summer maxima are concerned, upon the prevalence of flies, the typhoid maximum, having reference to the date of infection, occurs both in England and America some three weeks later than the maximum of diarrheal infection. It has furthermore been observed that in England an excessive prevalence of diarrhea in a town is often not correlated with an excessive prevalence of typhoid fever. The same phenomenon is noticed in the United States. Thus Fall River has the highest death rate from diarrheal diseases and one of the lowest from typhoid fever. Jersey City, New York City, and Providence stand high as regards mortality from diarrheal diseases, but low as regards mortality from typhoid fever.

Seasonal Distribution of Lice, Bugs, and Fleas. Hamer (Report of the Medical Officer of Health of the County, London, 1909, Appendix IV) has been studying this subject in the London lodging houses. He assumes that the number of beds in these houses showing infestation with these insects, is an indication of their prevalence. (The use of infestation in connection with insect parasitism, in distinction from infection with the micro-organisms, is quite general, but it is a question whether there is any

EDITOR'S NOTE: Readers are urged to send public health notes of interest to the Editor by whom they will be distributed to the proper reviewer. The sender's name or initials should appear under such notes.

such fundamental difference as this use of the word would suggest). Hamer finds that the maximum number of louse infested beds was during the first week in February, and gradually fell off to a minimum during the first week in June. The seasonal curve for bed bugs, on the other hand, was low during the winter, and gradually rose during spring and summer, attaining its maximum during the first week in September. The maximum for fleas also was in the first week in September but the number diminished less rapidly after that date than in the case of bed bugs.

Samples from Typhoid Carriers Difficult to Obtain. Johnstone (Report of the Local Government Board, 1909–10, XXXIX, Supplement, Report of the Medical Officer, 159) reports an interesting outbreak of typhoid fever at Jennet Hill, in England. Twenty-seven cases occurring since 1896 in a small village seemed in all probability to be due to a carrier. An attempt was made to secure samples of feces and urine from a large number of persons, but except in eighteen instances the attempt resulted in failure. Some claimed outraged modesty, others pleaded religious scruples, while others were simply obstinate. Four of the eighteen samples of feces showed the presence of typhoid bacilli, but Johnstone did not feel at all sure as to the real source of two of these specimens. The above is a good illustration of the difficulties which are likely to arise if health officials attempt a compulsory search for carriers, particularly if it is known that the carriers if found are to be at all restrained or annoyed.

Epidemic Diarrhea. O. H. Peters (Jour. Hyg. 1910 X, 602) reports a most careful statistical study of this disease in Mansfield, England, a town of about 30,000 inhabitants. The study is based on cases, rather than on deaths. These cases were obtained by a careful house to house canvass in certain selected districts. He believes that on this account his data present a truer epidemiological picture than we have before had of this disease. He believes that it is only by a most critical investigation in the home that all the cases of this disease can be discovered. Only about 12% apply for medical treatment, so that notification, even in the few cities where it has been adopted, entirely fails to show the prevalence of the disease. Peters finds that during the year 10% of the population are affected, with a case fatality of perhaps 1%. As hitherto, the mortality alone has usually been studied, we have been wont to consider it a disease confined chiefly to the first year of life, but Peters shows that while the case fatality and the mortality rapidly diminish after the first year, it is far different with the incidence of the disease itself. The largest number of cases are found in the second year, when they diminish until the twentieth year is reached, after which the disease again increases

in frequency. He believes that the period of incubation is short, from 6 to 36 hours, and that there is probably some immunity conferred by an attack. The duration of fatal attacks is usually about nine days, so that in studying the date of infection, the mortality curve should be put back that number of days. Although the number of cases involved in the study is not very large, they were most carefully collected, and their analysis is most minute, and Peters believes that his conclusions are fairly warranted. While, with others, he finds that the disease is far less common among breast fed infants, he believes this is due to the inhibitive action of the human milk, using the term inhibitive in its broadest sense. While cow's milk may be the bearer of infection, as are other foods, he does not believe that there is any warrant for assuming, as is usually done, that it is a very important vehicle of infection. Much attention is devoted to a consideration of whether the source of the infection is the soil, or human beings, and he finds that the evidence points strongly to the latter. He also finds a great amount of evidence showing that the disease is spread from individual to individual by what we call contact infection. The fly theory is subjected to a very careful analysis. No conclusive evidence is found for this theory, but a great deal is presented which favors it, and none which is strongly against it. Peters shows that it is by no means as necessary as some have claimed, that there should be an exact correlation between the fly curve and the diarrheal curve in order to render the fly theory probable. He finds that a careful analysis shows that the two curves, as worked out in London for instance, do not render untenable the causative relation of flies to epidemic diarrhea.

PERSONAL HYGIENE.

By PERCY G. STILES,
Assistant Professor of Physiology in Simmons College.
(*Reviewer.*)

Unrecognized Mischief in the Nervous System.

The "Ether Day Address" which was delivered in Boston on the sixteenth of last October by Dr. George W. Crile, is of uncommon interest.* In the first place it advocates measures in surgical practice which seem certain to result in the saving of many lives. In the second place it is full of suggestiveness for the reader outside the professional circle. Especially is it productive of texts for the preacher of hygiene. To abstract a paper so condensed and so manifold in its bearings is not entirely just to its author, yet we cannot refrain from the attempt.

The central emphasis is upon reflex action. The nervous system is for the most part engaged in the production of appropriate responses to the stimuli which beat unceasingly upon its receptors. Many of these reflexes are adapted to protect the organism against injury and such is the makeup of the brain and the spinal cord that the centres will expend their energy to the point of exhaustion and structural impairment in pursuit of this object. A surgical operation involves the severest stimulation of afferent paths through which strenuous defensive reflexes are normally excited. In the absence of an anaesthetic such stimulation would result in a bitter struggle continuing to utter prostration with both central and muscular damage. How far does anaesthia exclude this racking exercise of the nervous system? Not nearly so successfully, Dr. Crile thinks, as we have supposed. He has demonstrated that when a dog is placed under ether and its afferent nerves are irritated for some time the brain-cells exhibit changes in form and appearance. The alterations are of the same order as those long believed to signify profound fatigue. These changes are not due to the ether alone for they are not observed after anaesthesia without operation. They are therefore the result of the penetration of impulses to the gray matter and the discharge of the cells which in the waking condition have to do with powerful, protective reflexes. The anaesthetic has abolished the consciousness of pain, it has more or less checked muscular movement, but there is an amount of unavailing wear and tear in the centres hitherto unsuspected.

* The Boston Medical and Surgical Journal, December, 1910, Vol. CLXIII, p. 892.

We are reminded afresh that consciousness is associated with but a very limited part of neural activity. The conquest of pain by ether was a priceless boon, but to conquer pain is not necessarily to protect the vast fabric of the nervous system from the stress of over-stimulation. Two lines of advance are possible—to find a general anaesthetic that shall more completely shield the subconscious centres or to employ a local anaesthetic in addition to ether so that the hurtful impulses shall not ascend to the brain. The first desideratum is partially satisfied by nitrous oxide, an anaesthetic of which Dr. Crile is an able advocate. The second method of procedure also gives admirable results in his hands. The patient whose centres have been spared through the simultaneous use of ether to eliminate consciousness, and cocaine or some siniilar drug to isolate the field of the operation, is protected in a great degree from the dangers of shock or extreme exhaustion.

Let us now consider the realtion of this noteworthy contribution to Personal Hygiene. It teaches first of all that influences which are quite unfelt may be working harm within the nervous system. This is not new to be sure but it surely deserves more attention. Dr. Crile has dwelt upon the central injury proceeding from strong but relatively brief irritation; moderate but long-continued stimulation cannot be assumed to fail of effect. Long ago it was shown that during natural sleep the vasomotor centre gives reflex responses to shocks and sounds inadequate to rouse the sleeper. It is reasonable to infer that sleep in the midst of disturbing conditions falls short of its best effect even if the subject has schooled himself to remain apparently impervious to such stimulation. The insensible wear and tear experienced by one who lives near an elevated road has something in common with the damage wrought under an anaesthetic by unfelt irritation. In this case the "anaesthesia" consists in the cultivated power to sleep or, in waking hours, to attend to other things than the hideous sound. No doubt such discipline achieves a degree of protection. It is like ether in a surgical operation. But it is clear that we cannot assume that the power to turn the attention away from annoyance abolishes the injurious influence of the circumstance.

A capital example is that of a person whose health is undermined by eye-strain. A little far-sightedness has required the constant employment of the ciliary muscle and it has been denied its normal periods of repose. Or a typical astigmatism has induced the habit of rapidly shifting adjustment. The abused muscle or its governing centres may have radiated impulses to stations seemingly quite detached in locality and function. How profound the consequent disturbances may be is a matter of common observation yet the initial strain may have been but vaguely realized.

Finally, it is natural in this connection, to point out an element of danger in Christian Science and kindred cures. The primary step in such treatment is usually the suggestion of freedom from subjective symptoms. This is a form of partial anaesthia. Often it is induced with amazing success and often objective improvement follows. It may be almost a royal road to health where the original disturbance is capable of abatement through the modified activity of centres. But when the peripheral lesion is not to be healed by changes in secretion, blood-flow, or tonus, such treatment is on a par with the use of narcotics. It may be justified as a means of giving ease and serenity to the incurable. The mental adjustment that makes pain non-existent for the individual will always seem a display of moral heroism. But we have in Dr. Crile's address a valuable reminder that central mischief and subjective suffering are not inseparable. To remove the local cause of irritation is always better than merely to exclude its effects from consciousness. It is easy to conceive of cases amenable to medicine or surgery which under psychotherapy may show temporary improvement only to give evidence at last of the nervous disintegration which mental detachment could disguise but not prevent.

SANITARY ENGINEERING NOTES.

R. S. WESTON,
Boston, Mass.
(*Reviewer.*)

Water Supply of Jerusalem.* A description of the proposed water supply for Jerusalem. The population of the city is 80,000. The present supply is from cisterns. The annual rainfall is only 27 inches and much suffering and disease are caused, especially among the poorer people, by the scarcity of water. Evidently there has been a scarcity of water in Jerusalem for a long time. A masonry aqueduct, said to have been built in the time of Solomon, ran seven and one-half miles from the city on the road to Hebron to the Pools of Solomon. The source of this supply was impounded surface water augmented by a spring. In the sixteenth century the Mohammedans repaired this aqueduct and replaced the masonry with pottery pipes. Part of this aqueduct is still in use. In the second century the Romans projected an ambitious scheme which they did not seem able to finish. They took the water from reservoirs about twice as far from Jerusalem as the Pools of Solomon, and laid the pipe through a tunnel in the rock to this point, from which they started to run two aqueducts to the city. At one point a crossing of a ravine was attempted by means of a siphon made of hewn blocks of granite. The drought of 1901 drove the inhabitants to connect Jerusalem with the spring supplying the Pools of Solomon, but the four-inch pipe used is far too small for the needs of the city. A new supply is projected. A Bremen firm has made a proposition to put in a supply pumped from Ain-Fauwar situated seven or eight miles northeast of Jerusalem and 1640 feet lower. The old Roman source and the Pools of Solomon were investigated but the supply was not only too scanty but also required filtration. The proposal includes the turning of the property over to the city after thirty years. The rates for water will be $92 per million gallons. While the price seems high, public opinion seems to be in favor of this source, especially as the quantity is ample and the quality excellent, the water flowing from beneath rock cliffs.

* (Anon.) Eng. Rec. 62, 189. From recent Consular Report.

The First Garbage Reduction Works Built by an American City, Columbus, Ohio.* A detailed description of the new garbage reduction plant at Columbus, which was put into operation July 20, 1910. The garbage of the city is collected in covered carts and is delivered to a central station on the Hocking Valley Railroad, where it is dumped into cars by means of a power hoist which lifts the whole cart body from the running gear. Each evening the train hauls the garbage to the reduction plant four miles to the south of the center of the city, near the sewage disposal plant. The garbage is dumped from the cars, drained and sorted. The drainings are run into a catch basin from which they are discharged into grease separating tanks and afterwards evaporated. The garbage is sorted and conveyed by machinery to digestors. There are eight digestors, each 7 feet in diameter and 14 feet high. Each digestor holds from 10 to 12 tons of garbage. They are lined with concrete and tile to prevent abrasion and to resist the corrosive action of the acids in the garbage. After cooking the garbage is passed through roller presses which extract the water and grease. The vapors arising from the presses are taken to a condenser while the other vapors are trapped into the heat well and vent beneath the boilers. The mixed water and grease in the presses is conveyed to separating tanks, which are arranged in series. There are storage tanks for grease. The grease tank water contains from 5% to 7% of solids. This water is evaporated in a triple-effect. The tankage from the roller presses is dried in cylindrical dryers and afterwards screened. The concentrated syrup from the tankage evaporators is mixed with the screened tankage and the whole is dried in vacuum dryers. A percolating apparatus for extracting grease from dry tankage is now being constructed. The plant cost $180,000 and the sale of by-products thus far has paid for the cost of disposal.

Water Supply System of Santiago, Cuba.† A description and history of the Santiago water works, particularly of the new dam and reservoir in the hills and the improvements in the distribution system.

Water Purification Works at Canon City.‡ A description of the water works which consists of sedimentation basin, sand filters, and filtered water basin, all uncovered, of the usual type.

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* Osborn, I. S. Eng. News, **64**, 542-45.
† H. F. Cameron. Eng. Rec. **62**, 130.
‡ (Anon.) Eng. Rec. **61**, 82.

Sterilization of Water.* The authors give results of experiments which the Baltimore County Water & Electric Company have been making with slow sand and mechanical filters, with and without the aid of ozone and bleaching powder as sterilization agents. The results with the ozone sterilization apparatus are given and show considerable reduction in the numbers of bacteria. Since the construction of rapid filters at the Company's filtration plant at Avalon, Md., in 1908, bleaching powder has been used for sterilizing the water in connection with filtration at this plant. The chemical has been used continuously, not because of the failure of filtration alone, but to lessen the cost of operation and at the same time to deliver water which was practically sterile. Results show that the effluent from both slow sand and mechanical filters can be made practically sterile with a total elimination of *B. coli*, reducing the color from 5% to 15%; that it causes a reduction in the amount of alum and an increase in the length of runs between washings, and at the same time a reduction in the amount of wash water.

The calcium hypochlorite is more efficient when used with sulphate of alumina than when used alone.

The high turbidity in the raw water reduces the bacterial efficiency of the bleaching powder. The bleaching powder, even when used in large quantities, causes but a slight reduction in organic matter.

The bleaching powder was added directly to the reservoir water before filtration.

Operation of Settling Basins at Richmond, Va.† Since January 3, 1910, the new coagulating plant operating with muddy James River water has been in use for the supply of the City of Richmond. The reduction in turbidity and bacteria, also in the typhoid death rate, have been gratifying.

Creosote Treatment for Algae Growths.‡ Author describes his experience with the use of creosote applied annually to the water of the reservoir at Meridian, Miss. Less than 0.5 parts per million of creosote was added and as a result algae growths, as well as the presence of poisonous snakes, turtles, and eels, have been prevented.

Removal of Iron in Organic Combinations at Mount Hope, Canal Zone.‖ The water supply for the city of Colon, Panama, is so impregnated with iron held in suspension by organic matter that ordinary mechan-

* Walden & Powell. Amer. Water Works Assn. 1910, 128.
† Davis, E. E. Amer. Water Works Assn. 1910, 256.
‡ William F. Wilcox. Amer. Water Works Assn. 1910, 166.
‖ Downes, John R. Amer. Water Works Assn. 1910, 220.

ical filters became clogged rapidly. A coagulation basin was built to overcome this difficulty, with satisfactory results. The unfiltered water contains from 2 to 3 parts of iron per million and from 0.2 to 0.5 parts of N as albuminoid ammonia. The iron as well as the turbidity and color are practically removed and at a much reduced cost.

Porosity of Filtering Candles.* The author has made some experiments with porous filter tubes used in laboratories and households for filtering water, bacterial cultures, etc., and has found the efficiency to vary with the size of the pores. The bacterial efficiency is dependent upon both the true straining action and the capillarity of the pores. Grenet estimated the porosity of the tubes by determining the capillarity. The force varied with different tubes between 20 cm. and 2 m. of mercury. The method of testing is useful for the control of the manufacture of these tubes. Tubes or bougies should be saturated with distilled water before use. Otherwise the intensity of the capillary attraction may cause deep penetrations of organisms to be removed, some even passing through the walls. The efficiency of a bougie destroyed in this way is not restored by use.

Rapid Testing of Water.† An advertisement of the dionic tester invented by Digby & Briggs, manufactured by Evershed and Vignades, Chiswick W., London, England. This consists of a convenient portable apparatus for determining the electro-conductivity of water. The current is supplied by a small hand dynamo.

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* Grenet, F. Compt. rend., **151**, 941-43.
† (Anon.) Engineering. **90**, 807.

WATER PURIFICATION PLANT NOTES.

W. R. COPELAND, Columbus, Ohio.
(Reviewer.)

Carbonic or Other Acid Required to Decompose "Bleaching Powder."

Samuel Rideal calls attention to the fact that bleaching powder is disintegrated by carbonic acid and the "Hypochlorous acid" set free. He makes the following statements on pages 181 and 183 of his book entitled Sewage and the Bacterial Purification of Sewage, "When mixed with ordinary water containing carbonic acid, the latter decomposes the hypochlorite, setting free hypochlorus acid * * * ." And, "The soluble hypochlorites are alkaline; when acidified they give off chlorine or hypochlorous acid in vapour * * *. On the other hand the action of unacidified hypochlorites is very slow * * * ."

When the quick lime (CaO) used in water softening or for the precipitation of coagulants is added to purify a water it absorbs the carbonic acid which the water originally contained. As water softening and coagulation plants are increasing in number it is important to bear Mr. Rideal's remarks in mind. This fact is born out by the recent experience at the Columbus Water Softening Plant.

Early in the year 1909 the City Officials were advised to put hypochlorite of lime into the purified water to remove the few bacteria which the Water Softening Process had not destroyed. Early in December, 1909, the Scioto River being in flood, bleach was applied to the partially softened and settled water, at a point after the quick lime had been added. During a similar period in 1910 the bleach was applied to the raw water before adding the CaO. The bacterial results, obtained during these two periods are given in the following table.

Period	Bleach — Point Applied	Whole Numbers of Bacteria per C. C. Presumptive Test for B. Coli.								
		River Water			Filtered Water			River Water	Filtered Water	
		Maximum	Min.	Aver.	Max.	Min.	Aver.	1 c. c.	1 c. c.	50 c. c.
Dec., 1909	Settled Water	103,000	2,500	34,600	40	0	13	19 days	4 days	10 days
Dec., 1910	River Water	285,000	9,000	83,900	52	1	14	9 days	0 days	2 days

The data given in the preceding table show that the bleach reduced the whole numbers of bacteria in a satisfactory manner in each period but that the reduction in numbers of *B. coli* was decidedly more marked in 1910, when the bleach was being added to the river water (charged with carbonic acid) before the quick lime had been applied for water softening. This indicates that the carbonic acid in the river water decomposed the bleach more efficiently, and suggests that when hypochlorite of lime is to be used as a germicide at water softening or coagulation plants it should be added to the raw water.

PUBLIC HEALTH NEWS AND NOTES.

B. L. ARMS, M. D.,
Director of the Board of Health Laboratory, Boston, Massachusetts.*
(*Reviewer.*)

The Supreme Court Decision of Minnesota filed December 3, 1910, seems to be so far reaching and important to sanitarians that our space this month is devoted to that entirely, the following copy being received from Dr. H. W. Hill, Epidemiologist of the Minnesota State Board of Health.

16282-3.

STATE OF MINNESOTA, SUPREME COURT, APRIL TERM, A. D. 1910, Nos. 5-6

DELIA KEEVER, as Adm'x, *Appellant v.* THE CITY OF MANKATO, *Respondent.*

KATE FLANAGAN, as Adm'x, *Appellant v.* THE CITY OF MANKOTA, *Respondent.*

SYLLABUS.

A complaint charged that defendant city negligently allowed the supply in its waterworks system to become polluted with poisonous substances and large quantities of filth and sewage to escape into and saturate its water supply, by reason whereof plaintiff's intestate contracted typhoid fever and died as a consequence.

On demurrer it is held: (1) The municipality was liable for its negligence in its private or corporate capacity, and was not exempt because it was carrying out a governmental function.

(2) Under section 4403 an administrator of a person whose death was due to the wrongful act of a municipality may maintain an action for damages consequent thereon. *Malone v. City*, 40 Minn., 406; *Orth v. Village*, 87 Minn., 207, followed.

Reversed.

OPINION

This is an action for death by wrongful act occasioned by the negligence of the defendant city.

The complaint alleged that defendant, a municipal corporation, negligently allowed waters and the water supply in its water works system to

* State and City Boards of Health and other organizations are requested to send copies of their reports, bulletins, etc., to the above address for review.

become infected and polluted with poisonous substances "and large quantities of filth and sewage, all of which were saturated with the germs of disease * * * * and did carelessly, negligently * * * * permit * * * * filthy, foul and dangerous subtsances, common sewage and other filth to escape into and saturate the water supply;" that by reason thereof the water became imminently dangerous to life and health of which defendant had full notice and knowledge that plaintiff's intestate, a citizen and resident used the water, contracted typhoid fever and died in consequence. The complaint set forth additional facts as the right of the administrator to recover. Defendant's demurrer to plaintiff's complaint was sustained. From that order the plaintiff appeals. It is to be noted that the complaint in the case at bar set forth not a mere action against the defendant to recover damages because the city failed to provide an adequate supply of pure water. The question here is whether the city is liable for, among other things, recklessly causing dangerous substances like common sewage and other filth to saturate its water supply and the wells, mains and appurtenances thereto.

The first essential question is whether the city is exempt because it was carrying out a governmental function, or whether it is liable because it operated the waterworks in its private or corporate function.

The defendant naturally insists that it was performing merely a governmental function. There is ambiguity in that term as used in this connection. It may mean that the operation of waterworks by a municipality is *intro vires* as distinguished from *ultra vires*, or it may mean that such function is public as distinguished from private or proprietary, in which capacity the city may voluntarily assume for business purposes and for its own advantage to conduct certain operations and is held responsible for negligence therein, although work is done ultimately for the benefit of its citizens. Many of the authorities to which defendant refers us properly hold that a city may properly operate waterworks. They have no tendency whatever to determine whether or not the city is or is not exempt in its operation of waterworks.

Defendant also insists that the city can make no profit out of its operation of these waterworks. Doubtless this is in a general way true; at all events it may be here admitted. But the sequence which defendant seeks to draw does not at all follow, i. e., that therefore it should be exempted from all liability from mismanagement. For the city is liable for neglect in connection with its streets, sidewalks, and sewers, from which in their very nature no profit is or can be made. The city operates the waterworks for profit in the sense that it is voluntarily engaged in the same business which when conducted by private persons is operated for profit. The city

itself makes a reasonable and varying charge. The undertaking is partly commercial. It is enough that the city is in a profit making business. "The city is exercising a special privilege for its own benefit and advantage although a portion of the water is used by the city for protection against fire and in promoting the public health." Hammersley, J., in *Horrigan v. Norwich*, 77 Conn. 358. The English authorities regard cities in such matters as "substitutions on a large scale for individual enterprises." Mr. Justice Blackburn in *Mercy Deck Trustees v. Gibbs*, L. R. 1 Eng. & Ir. App. cases at page 107, approving Mr. Justice Mellor in *Coy v. Wise*, 5 B. & S. 440.

Finally defendant insists that it would not be sound policy to open the door and permit actions like the present to be maintained for the reason that as a result the defendant city as well as any other city would be liable at any time to have the same misfortune and would be bankrupted thereby. The assessed valuation of the city is less than $4,000,000. If the city is not exempted from liability it is subject to claims of the same nature as the present amounting to over $10,000,000. Thus the very existence of the city is threatened and the city subjected to total destruction, which could be of no proportionate advantage to the individuals who suffered. It readily suggests itself as an answer to this dark prognostication that the number and nature of these cases does not appear in the record and is not known to the court; besides for the purpose of this case the neglect of defendant is necessarily assumed.

To the defendant, under the law, a number of defenses are available. How conclusive they may be in fact is wholly beyond any conjecture which we can recognize. Accordingly we must regard defendant's figures as purely hypothetical. The question is one of general principles recognized by the law and not of the private views of court or counsel as to what the convenience or necessity of a particular city may dictate under particular circumstances. The general experience of public and private waterworks is that ordinarily their operation involves no such financial disaster as defendant portrays. It is obvious that a sound public policy holds a city to a high degree of faithfulness in providing an adequate supply of pure water. Nor does it appeal why the citizens should be deprived of the stimulating effects of the fear of liability on the energy and care of its officials; nor why a city should be exempt from liability while a private corporation under the same circumstances should be held responsible for its conduct and made to contribute to the innocent persons it may have damaged. As Elliot, *J.*, said in *East Grand Forks v. Luck*, 97 Minn. 373: "When the municipality enters the field of ordinary private business, it

does not exercise governmental powers. Its purpose is, not to govern the inhabitants, but to make for them and itself private benefit.

As far as the nature of the powers exercised is concerned, it is immaterial whether the city owns the plant and sells the water, or contracts with a private corporation to supply the water. It is not in either case exercising a municipal function. * * * * * * * When a municipality engages in a private enterprise for profit, it should have the same rights and be subject to the same liabilities as private corporations or individuals." See *Powell v. Duluth*, 91. Minn., 53; *Furgeson v. Doran*, 103 Minn., 43; *State ex rel. v. Bd. Water & Light*, 105 Minn., 472. Thus in *Wiltse v. Red Wing*, 99 Minn., 255, a city operating the waterworks was held liable for water escaping from an embankment under the rule, in *Rylands v. Fletcher*. "For," said Start, *C. J.*, "although a municipal corporation, it was engaged in the business of supplying water to its inhabitants for profit, an undertaking of a private nature."

This is undoubetdly the general rule. See *Piper v. Madison*, 122 N. W. 730; *Park Commissioners v. Common Council*, 28 Mich. 229; *Baily v. Meyer*, 3 Hill 531; (as to the reasonsing of this case, however, see *Darlington v. The Mayor*, 31 N. Y. 164-198. Cf. *Messane v. Mayor*, 160 N. Y. 123, *Aldrich v. Tripp*, 23 Am. 434; *Ill. Trust Co. v. Kansas City*, 76 Fed. 271, 282; *Winona v. Betset*, 169 Fed. 321; *Judson v. Wingstead*, 68 Atl. 999; *Wagner v. Rhode Island*, 21 L. R. A. 522; *Esberg v. Portland*, 43 L. R. A. 435; *Brown v. Salt Lake City*, 14 L. R. A. n. s. 619; *Horrigan v. Norwich*, 77 Conn. 358; *Syracuse v. Springfield*, 174 Mass. 430; *City of Chicago* v. *Selz*, Schwab & Co., 202 Ill., 545; *Philadelphia v. Gelmarlieu*, 71 P. 141.) *Springfield Fire & Marine Ins. Co., v. Village of Keeseville*, 42 N. E. 405, *Asher v. Hutchinson, etc., Co.*, 61 L. R. A. 58.

The cases in which a city has been held responsible or irresponsible for damages by fire consequent upon an adequate supply of water are in a class of cases by themselves. From many points of view the rule holding the city liable for its negligence is not consistent with the rule there announced. The law does not undertake to achieve the impossible. As was said in *Gould v. Winona Gas Co.*, 100 Minn., 268 pp. 264: "It is evident that the ultimate justification of the inapplicability of the rule (there in question) lies in the controlling regard of the common law not for doctrine but for common sense. Its paramount object is to work out substantial and not physical justice. Its just claim to distinction is to be found not in the logical consistency of its applied theories but in the practical wisdom with which it has adapted its rules to varying subject matter and conditions."

Defendant also urges that in no case has the city been held liable for negligence in the operation of its waterworks unless the act involved a

trespass, or an invasion or a direct property right. Thus water escaping from a city reservoir runs onto another's property and does damage; this is trespass and there is liability. *Wiltse v. Red Wing*, (supra). But if the escaping water should do damage to a person and a public highway there would be no trespass but the law would recognize liability. Liability of the city is recognized in the case of streets and sidewalks which cannot properly involve trespass. Nor has defendant shown any reason for imposing liability, in the case of trespass or the breach of insurance of safety which does not logically apply to cases of negligence. On general principles liability for negligence is more just and more generally recognized because it is based upon culpability.

(2) The question then arises whether upon the assumption that plaintiffs intestate could have maintained an action against the defendant city had he lived can his executor maintain an action under our statutes. Section 4403 revised statutes provides "when death is caused by the wrongful act or omission of any person or corporation the personal representative of the decedent may maintain an action therefor if he might have maintained an action had he lived, for an injury caused by the same act or omission." Defendant has pressed upon us very earnestly that "corporation" as here used refers only to private corporations, (See Sec. 2839, revised laws 1905) and does not include municipal corporations. The matter is not de novo in this state. In *Malone v. City of St. Paul*, 40 Minn., 406, and in *Orth v. Village*, 87 Minn., 237; the administrators of deceased persons were allowed to pursue the statutory action against the city for negligence causing death. Such has been the settled construction in practice for many years. We do not feel at liberty to change that construction.

Reversed. JAGGARD, *J.*

The above was copied from a certified copy of the Clerk of the Court, at the office of the Epidemiological Division of the Minnesota State Board of Health, January 5th, 1911, by M. S. Robertson.

Further Developments in the Ohio State Board of Health. Since the first of January the following resignations from the staff of the Ohio State Board of Health have occurred: Mr. A. J. Slack, Chemist; Mr. L. V. Parker, Bacteriologist; Mr. Edgar Parker, Laboratory Assistant; Mr. R. W. Ferris, Assistant Engineer; Mr. C. E. Shockey, Correspondence Clerk. This leaves twelve of the original staff of twenty-seven. Mr. Slack has accepted a position with the Lederle Laboratories, New York City, and Mr. Parker is now Assistant Bacteriologist of the North Dakota State Board of Health Laboratory.

The Board has appointed in the interim a stenographer, a messenger, a laboratory helper and a clerk, and has requested the legislature to approve an appropriation of $1500.00 for an epidemiologist and $500.00 for the services of a pathologist.

In the COLUMBUS DISPATCH for February 25th appears the following: "A scheme is being hatched to inject politics into the State Board of Health. * * * It is proposed to reorganize the Board and appoint a Democrat to succeed Dr. C. O. Probst, of Columbus, who has filled the position of Secretary for a quarter of a century. Saturday, Mr. John W. Hill, of Cincinnati, one of the new Democratic members of the Board secured an opinion from Attorney-General Hogan as to the status of Dr. Probst's position. He wanted to know if he should be regarded as a public officer or as merely an employee of the Board, and subject to removal for cause. The ruling of the Attorney-General is * * * that he is an employee of the Board. It is apparent that this information was asked for to learn if there were any barriers in the way of changing the office, so that a Democrat could be put into it."

THE CLEVELAND MEDICAL JOURNAL in its editorial columns (February number, p. 145) reviews the situation in detail.

Dr. R. H. Grube, Xenia, Dr. Hasencamp, Toledo, and Dr. H. T. Sutton, of Zanesville, have recently been appointed members of the Ohio State Board of Health by Governor Harmon to fill the three vacancies existing on the Board. It is evident that the future of the Department depends much upon the attitude of these three men.

B. R. R.

ANNOUNCEMENTS AND COMMUNICATIONS.

Bacteriological Museum and Bureau for the Distribution of Bacterial Cultures. The Department of Public Health at the American Museum of Natural History has equipped a laboratory to serve as a central bureau for the preservation and distribution of bacterial cultures of both pathogenic and non-pathogenic organisms, and particularly of types of new forms and varieties. It is hoped that the laboratories of Medical Schools, Colleges, Boards of Health, Agricultural Experiment Stations, etc., and those engaged in biochemical work of all sorts, will furnish the Museum with cultures at present in their possession, and the laboratory is now ready to receive and care for such cultures. Only organisms which have been identified and which have a definite history are desired as a rule; but in the case of rare species, like the organisms of certain tropical diseases, this rule may be departed from. The laboratory cannot undertake to maintain more than fifteen different strains of any particular form. Types of new species and varieties are particularly desired at the present time and as they may be isolated in the future.

The laboratory plans also to keep on file descriptions of bacterial species in print or arranged in the form of the standard card and will be grateful for copies of any such descriptions.

Descriptions filed in the Department will be carefully preserved and living cultures will be kept in good condition, so far as possible, and will be supplied at all times without charge to Corresponding Laboratories and furnished so far as possible and with a reasonable charge to schools and other institutions which may desire cultures. The laboratory, of course, cannot undertake to keep on hand difficultly-cultivable bacteria, such as can be maintained only for a few weeks after isolation from the body; neither can it at present supply virulent cultures which rapidly lose their virulence under laboratory conditions. It should, however, be able to furnish cultures of organisms of all the ordinary types, which can be maintained under cultivation. Pathogenic forms will be sent only to properly qualified persons.

AMERICAN MUSEUM OF NATURAL HISTORY,
77th Street and Central Park West, New York.
Department of Public Health.

BOOK REVIEWS.

Thirty-ninth Annual Report of the Local Government Board 1909-10. Supplement, Report of the Medical Officer. 7 s. 6 d.

These reports have a steadily increasing value and should be in the hands of everyone interested in epidemiological work. The one referred to is of special interest. A new departure in this report is the introduction of data and discussion concerning the prevalence of contagious diseases in England and Wales. The subject of infant mortality is again briefly considered and a new and interesting diagram presented illustrating the correlation between mortality in infancy and at later ages. The diminished virulance of scarlet fever is illustrated by the fall in the mortality from 72 per 100,000 in the years 1871-80, to 11 in the years 1901-8, and by the case fatality in the London hospitals, which fell from 12.1 to 2.4. Isolated outbreaks of a severe type do, however, continue to occur, and there was one such in the Isle of Portland, consisting of 23 cases with 11 deaths. Several milk outbreaks of scarlet fever are reported, in one of which 25 persons sickened out of 48, who, on a single occasion, partook of the infected milk. A small diphtheria milk outbreak also is reported.

In the decade 1871-80, the mortality per 100,000 for typhoid fever was 33, which was about what it is in American cities at the present time. In the years 1901-8 it had been reduced to 10, which shows what we ought to do here. An excessive prevalence of typhoid fever still persists in some parts of England, notably in the County of Durham. The conditions in this county have been very thoroughly reported upon by Dr. Wheaton. He finds that little or no typhoid fever is attributed to water. But it is the same old story of filthy and overflowing privy vaults, defective scavanging, flies and absence of soap and water. Although the county as a whole has a pretty continuously high death rate from this disease, its local distribution is very irregular. This indicates that there is no persistent endemic infection, but that the disease lights up here and there in filthy neighborhoods, as infection is introduced from without. Dr. Wheaton connects an excessive prevalence with dry seasons.

Shell fish are suggested as a probable source of typhoid fever in a number of instances, and 13 cases are said to have been due to the eating of mussels collected from the bottom of a ship in dock. At North Ormsby, Johnstone found that 16 of 62 cases had eaten raw mussels within 5 to 21 days of their illness. A house to house investigation of 827 persons without typhoid fever, showed that less than eight per cent had eaten mussels during the whole of the summer. This is less than a third of the percentage of mussel eaters among typhoid fever cases.

Among other important papers in the report is one by Savage on the examination of 64 samples of prepared food, and 18 of brine for the presence of Gaertner's bacillus. None were found. He believes that they only come from diseased meat. There are also papers on the Bacterial Measurement of Milk Pollution, Types of Cells in Phagocytosis, and the Chemical Aspects of Epidemic Diarrhea.

Scholberg and Wallis, the writers of the last paper, find a correlation between a high bacterial count in milk, and the presence of certain peptones and peptone like bodies which produce an irritating affect upon the intestines.

The most important paper in the report is one by J. C. G. Ledingham, on Typhoid Carriers. This is by far the most important and comprehensive contribution to this subject which has yet appeared. It is divided into fifteen chapters and contains a copious bibliography. The author considers the frequency of carriers, their infectivity, pathogenesis, auto-infection, treatment, diagnostic methods, the immunity of carriers, and their control, and many other topics.

C. V. CHAPIN.

Bamberg, Fr. Über Grundwässerenteisenung mit spezieller. Gesund. Ing. 33, 147-51, 217-21, 240-43. Chem. Zentr. 1910. I. 1853.

This is a continued article, the report of a lecture before the Polytechnic Society in Berlin, discussing the physics, chemistry and engineering of the various deferrization processes, especially of the so-called closed (pressure filter) systems. The author describes the different conditions in which iron exists in ground water, paying special attention to the organic compounds. Not only is iron combined with humic acids, but the hydrate is held in solution by the presence of organic matter. He describes the change of the soluble iron by oxidation into the hydrosol and later into the hydrogel form, and states that certain salts and compounds aid while others hinder this transformation. The favoring substances are those which form hardness in water, which do not include, of course, contact action which is effective when water containing iron and oxygen is passed through rieslers or filters, nor the beneficial effect produced by an accumulation of hydrate upon the filtering material. The chief retarding agents are CO_2 and dissolved organic matter. Sometimes, no matter how intensive the aeration, the organic matter will keep the hydrosol in suspension or solution. All efficient processes depend upon the oxidation of the dissolved iron, the formation of the hydrogel, and the removal of the latter by filtration. Oesten has noticed the re-solution of iron precipitated out in distribution systems supplied with water from which the iron, but not the CO_2, has been removed. The author states that once oxidized the hydrate in the pipes cannot be redissolved, but on the other hand, if CO_2 be present the metallic iron in the pipes may be dissolved, and if oxygen be present this may be oxidized. In a ground water there is usually a struggle between the O_2 and the free CO_2 and of the two factors the O_2 is always the stronger. Ground waters containing free CO_2 stored in bottles frequently show the presence of precipitated hydrate if they contain a small amount of dissolved oxygen. The author mentions the closed systems and remarks upon the necessity for the presence of oxygen in order to obtain a complete removal of the iron. It is as necessary to aerate the water in closed as in open systems. He describes the two common open systems, namely, the Oesten, where the water is sprayed on to a sand filter, and the Piefke, where the water is aerated by passage downwards through a so-called riesler or scrubber and afterwards filtered through sand. The same conditions must be obtained in closed filter—sthat is O_2 must be admitted to the water and CO_2 removed.

The author mentions many ground waters containing large amounts of organic substances, part of which are in combination with the iron. Many of these waters contain nitrogen and in some cases phosphoric acid. This would be expected from their association with peat bogs and fossil deposits. Although it cannot be proved analytically, many waters contain reducing agents which have a stronger affinity for the iron than does the oxygen of the air. In such cases the author finds that ozone is the most efficient, though perhaps not the most economical, means of purification. H_2O_2 can be used but it is eight times as expensive as O_2.

The presence of sodium chloride in the amounts usually present in drinking water has no apparent effect upon the precipitation of the iron. Waters containing compounds of iron and mineral acids—for example, the drainage water from mines—can be purified best by the addition of chemicals, usually lime and soda ash, aided at times by sulphate of alumina and ferrous sulphate. The closed systems are described. The earlier types of these were badly constructed and did not produce the desired effects. They have been perfected, however, and Bamberg states that he has used closed filters for the purification of water containing 25 mg. Fe per L.. successfully. Many of these plants depended for the oxidation of the iron upon air admitted to the pump suction. This was uneconomical and inefficient, largely because the CO_2 was not removed. Many such plants succeeded because the amounts of iron to be removed were small. In some cases, where H_2S was present, the filtered water possessed an objectionable odor. Most of the old types of closed filters were filled with shavings or "excelsior." Where inorganic matter (iron ores, gravel, sand, etc.) was used, the efficiency was much less. The wood filling became foul frequently and had to be removed and sterilized. Furthermore wood fibres passed the filters and accumulated in the distribution system. Many attempts were made to utilize the oxides of the metals for filtering material with the mistaken idea that these oxides, especially tin oxide, would act as carriers of oxygen and cause precipitation of the iron. Subsequent experiments have shown that the oxides take no part in the chemical reaction. The wood filling of the filters frequently decomposed and disinfectants were suggested and used, but the author condemns this practice. Either the disinfectants are soluble in water and soon wash out, or if not, give a disagreeable taste and odor to the water.

The author describes the Breda system and believes that it possesses distinct advantages over the other closed deferrization plants. The apparatus comprises mixing and reaction chambers and filter. The reaction chamber and filter are contained in a tall cylinder, the mixing chamber being attached to one side of the latter. Aeration is accomplished by forcing the air into the water. The mixed air and water pass through the mixing chamber and thence at a high velocity through jets and baffle plates at the bottom of the reaction chamber, which latter is filled with medium sized broken porcelain. The water passes upward through the porcelain and thence downwards through a central pipe to the mechanical filter placed beneath. The whole apparatus is self-contained. The excess of air is vented automatically. This also carries away any odorous gas. The loss of head in the apparatus can be raised from 10 to 15 pounds before washing is necessary. The reaction chamber is cleaned by flushing, the filter by washing with reversed currents. The reaction chamber removes most of the iron, leaving the filter to remove the last traces and also any Mn. From 1% to 1.3% of wash water were required in the two cases cited from practice. The excess of accumulated hydrate, which is of course a most favorable aid to the process, is washed out from the reaction chamber once in from 3 to 6 weeks.

Without agitation the filter sand becomes incrusted with hydrate. In the Breda system rakes are used to agitate the sand during washing. A complete description is given of a large plant having a capacity of 75,000 gallons per hour, installed at the Zoological Gardens in Berlin. The advantages and disadvantages of the closed or pressure systems are similar to those for pressure filters used for water purification. Aeration by this process may be more expensive, especially as the author states that a volume of air equivalent to from 5% to 50% of the volume of water, may be necessary to effect a completed removal of the iron. From a hygienic

standpoint the system has many advantages, especially as the water is not exposed from well to tap. Introduction of air, however, may infect the water with bacteria. This can be prevented by filtering the air. Ordinarily the filter material is sterilized before using.

Regarding the permissible limits of iron in filtered water, the author states that from 0.1 to 0.2 parts per million will not cause turbidity of the effluent. Some water, however, will hold 0.3 parts permanently in suspension. In some industries, notably bleacheries, it is essential that no iron be precipitated from the water after filtration, although good results have been obtained with a water containing as high as 0.3 parts of iron per million provided it was held in solution throughout the whole of the bleaching process.

Not only is iron necessary for the growth of Crenothrix, Leptothrix, Gallionella and other thread fungi, but also organic matter. Manganese in small amounts usually accompanies iron and is removed with it. The reaction is slower, however, and more contact and time are necessary for its removal. When present in large amounts its removal is extremely difficult. For this purpose the use of artificial zeolite "Permutit," known as the Gans process, also the use of potassium permanganate, is not considered practicable. Usually it is more economical to employ lime rather than the expensive "Permutit"; this costs 5c. a pound, is slightly soluble in water, does not resist abrasion well and entails considerable expense for its regeneration and renewal. The author prefers to depend upon intensive aeration, agitation and contact, which have been sufficient in all cases within his experience to effect a removal of both iron and manganese.

R. S. WESTON.

Department of the Interior, U. S. Geological Survey Water Supply Paper No. 255. Underground Waters for Farm Use by Myron L. Fuller.

This paper is a very comprehensive study of the different types of private water supplies commonly used in this country. There has long been a need for the compilation of this material in the clear and concise form presented by the author. While this paper relates primarily to the types of supplies common to farms, yet much of the data recorded is of general application. The report takes up the underground sources of water supply, describing in detail, the water-bearing formations, the occurrence of water in the formations and the relative safety of the materials. A description is given of all the common sources in use, namely, lakes, ponds, streams, springs, wells and cisterns. The reasons for the use of the different sources in various sections is discussed. The author then takes up the underground types individually, describing their protection which includes a very detailed description of construction. Under springs the different kinds are named, possible sources of pollution mentioned and the means of protection described. Wells are discussed under their respective types. The location, methods of construction, common sources of contamination, protection from pollution and other information relating to such supplies is given in detail. The subject of cisterns is dealt with at some length furnishing information regarding their advantages and disadvantages, location and construction.

The following sentence is quoted from the introduction of the paper. "Typhoid fever is now almost universally believed to be transmitted solely through drink and food taken into the stomach, and is especially liable to be communicated by polluted water obtained from shallow wells near spots where discharges of typhoid patients have been thrown upon the ground and subsequently carried down through the soil

and into the wells, and it is doubtless principally this fact that makes the disease so common in farming regions." In this sentence the author makes it appear that the shallow farm well is the principal factor in making typhoid so common in farming regions. The writer has had occasion to investigate considerable rural typhoid and believes this statement too broad for general application. The results of detailed investigations in the state of Minnesota have brought out the following facts.

(1) The water supply is usually not the source of typhoid upon the farm.

(2) The more extensive outbreaks upon farms are associated with polluted surface supplies.

(3) The condition of a water supply usually represents the sanitary condition of the farm and therefore indicates the potentiality of a typhoid outbreak. Therefore, with general unsanitary surroundings the means of transmission are multiplied from every source.

In the forthcoming biennial report of the Minnesota State Board of Health, Dr. H. W. Hill, Director of the Epidemiological Division, draws the following conclusions from his recent studies "that contact, flies and milk, and seldom water are the cause of rural typhoid in Minnesota." A common tendency of the past has been to blame water almost indiscriminately for typhoid when other such factors, frequently overlooked, are more probably to blame.

H. A. WHITTAKER.

A Manual of Personal Hygiene by American Authors. Edited by Walter L. Pyle, A. M., M. D. Fourth edition revised and enlarged. Philadelphia and London: W. B. Saunders Company, 1910.

That this book has run through four editions and three reprintings within the space of eleven years is sufficient attestation to its worth and usefulness.

The preface to the first edition states in part: "the object of the manual is to set forth plainly the best means of developing and maintaining physical and mental vigor." That this has been accomplished successfully without recourse to any unnecessary flow of technical language is very evident to anyone who takes up the volume; at the same time there is an entire absence of presentation of fads or fantastic theories at variance with the best accepted beliefs of the medical profession of today. Despite the fact that the book has been written by some nine different authors, the defects of divergent individuality of expression have been practically deleted, thus giving to the work a most desirable smoothness of composition throughout.

The introductory chapter forms part of an admirable address on the "Teaching of Hygiene in the Public Schools" given by the editor, Dr. Pyle, at the meeting of the American Academy of Medicine in Washington in 1903, and it well serves to place before the lay reader the great necessity for a substantial grounding in the facts that underlie healthy physical welfare and a proper system of personal hygiene.

The other chapters of the manual are contributed by the editor and eight other well-known members of the medical profession who write upon the subjects of their individual specialties. These topics are ably discussed under the following heads: Hygiene of the Digestive Apparatus; Hygiene of the Skin and its Appendages; Hygiene of the Vocal and Respiratory Apparatus; Hygiene of the Ear; Hygiene of the Eye; Hygiene of the Brain and the Nervous System; Physical Exercise; The Body-posture; Domestic Hygiene; an Appendix dealing with the Pulse, Respiration, Baths, Massage,

Accidents and Emergencies, Poisoning, a Table of Poisons and Antidotes, and a Glossary of Terms used in the Text.

Upon comparing this with the third edition, one finds that the only new material incorporated, (preface notwithstanding), is a chapter upon body-posture by Dr. Joel Goldthwait, of Boston, in which is adequately described the evils accruing to the individual from the formation of bad habits in maintaining a poor carriage of the body, together with recommendations as to the best means to be adopted in overcoming them, particularly in the growing child; and it is noticed that the chapter on Domestic Hygiene has two sections devoted to a discussion of the special methods of combatting diphtheria and scarlet fever

No book is without its faults, and this manual in a small way is no exception to the rule. It is to be regretfully noted that in making the revision, the editor did not see fit to write a proper preface to this edition, rather than feebly revamping the one that did service for the preceding edition, inasmuch as the statements made then do not now fit the facts as found.

Another error of revision is to be found in the statement that the author of the chapter on Physical Exercise, Professor G. N. Stewart, is a member of the faculty of the University of Chicago, whereas he has been connected with that of Western Reserve University since the latter end of 1907.

In the chapter on Domestic Hygiene the same error that appeared in the previous edition on page 391, is carried over to page 409 of the present one, wherein it is stated that the *flea* is concerned in the transmission of the spotted fever of Idaho and Montana instead of the tick, *Dermacentor andersoni*. In this same section of the book, stronger criticism might have been used against the employment of domestic filters, and a little more space devoted to the discussion on a hygienic milk supply.

On the article on The Skin and Its Appendages, the writer in speaking of poisonous hair dyes might have mentioned "Mrs Potter's Walnut Tint Hair Stain;" this and another so-called "harmless" hair dye, "Eau Sublime," have been found on analysis to contain a poison, paraphenylen diamin, and according to the Journal of the American Medical Association* the former preparation has been concerned in causing twenty-four cases of poisoning by this substance.

One of the unintentional humors of expression of language is seen on page 117, line 19 from the top of the page, where the writer, in speaking of the excessive use of the voice, warns his reader thus: "no one should sing until the larynx becomes fatigued."

In making a comparison of the publishers' statements, to be found on the reverse sides of the title pages of the third and the fourth editions of the manual, referring to the times of printing, revision, electrotyping, copyrighting, etc., the inquisitive reader is struck with the great divergence of dates mentioned therein.

In appearance the book is attractively gotten up, neat, well printed, and remarkably free from typographic mistakes; numerous and suitable half-tone reproductions and drawings sufficiently illustrate the text.

The reviewer takes pleasure in recommending the volume to the laity and others interested in the subject of personal hygiene.

NORMAN MAC LEOD HARRIS.

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* Jour. Am. Med. Assoc., 1910, IV, p. 1162.